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Kids, Wildlife and Their Environment

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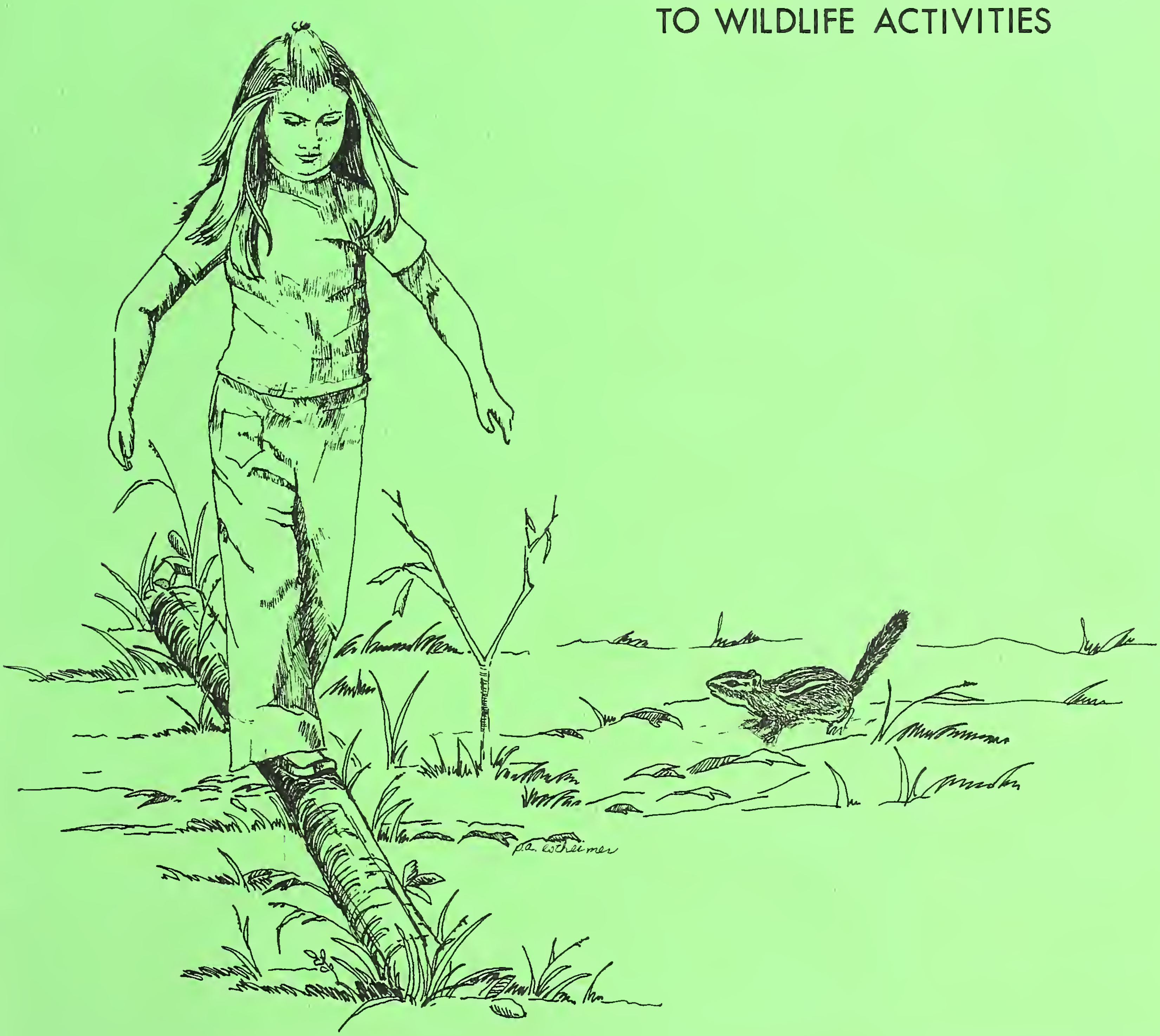
AN ELEMENTARY TEACHERS' GUIDE TO WILDLIFE ACTIVITIES



There are some who can live without wild things, and some who cannot. Like winds and sunsets, wild things were taken for granted until progress began to do away with them. Now we face the question whether a still higher 'standard of living' is worth its cost in things natural, wild and free.

Aldo Leopold

WORDS BY: Lou Hoffman, Pennsylvania Game Commission
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KIDS, WILDLIFE AND THEIR ENVIRONMENT

There is something about an animal, be it a bug or a bird, that grabs a kid's attention. It happened to you, it happened to me and it's happening to kids today--and we're not taking advantage of it. In a small way we'd like to change that, and we need your help!

Maybe we fall short in our efforts because we don't take time to consider what it was about those animals that "grabbed" our attention when we were where our children are today. Growing up takes the edge off things. That's unfortunate. John Burroughs, one of our great naturalists, summed up the ideal when he said, "To have a boy's heart below a man's head..." Numerous quotations would fit that idea, but words sometime fall short of the feelings we experience. The point is, environmentally, these times are critical. That's been said, re-said and overworked--but it's true. Making decisions and understanding the possible alternatives is a challenging thing for a teacher to relate to kids, especially in an objective way.

Through coordinating and developing environmental education materials we do see problems, and not all of them are with the environment. Because of some undecipherable maze, teachers, and good teachers, are unaware of classroom activities and resource aids that can add "pazazz" to their classes. We hope this publication will address one particular areas--our wildlife resource--and make your teaching more versatile.

Our goal for this publication is to develop in young people a positive attitude toward wildlife and the environment we share. We want these youngsters to understand the realism of the life and death struggles wild creatures experience. Not only, though, do we want to address basic ecological principles, but we want to touch on values as well. Through these exercises we hope your youngsters will become more aware of the interactions and interdependencies existing between the biological and physical parts of the total environment, realizing that man influences greatly wild animals and the places where they live.

A stronger goal is to encourage youngsters to become individually motivated to do their share in lessening environmental problems and improving their personal environment. It's a big goal but an important one.

Man is inseparable from this system that contains bugs, birds, bats and butterflies, yet he's the only member of this living community that has the ability to alter the interrelationships molding our natural world. He has a responsibility, not only to the environment, but to himself because of this interdependence. Tomorrow is an important time, and kids are tomorrow.

Yes, we do need your help and this booklet is for you. Adapt it. Change it. Use it in any way that fits your needs. We have deliberately arranged these activities with flexibility in mind. We want you to have as much latitude as possible. If, through your efforts, a child may rethink an attitude, question something common or mold a value judgement...it's working.

Thanks for caring about kids, thanks for caring about wildlife, and thanks for caring about the environment we all share.

Lou Hoffman
Pennsylvania Game Commission

Lou Ritrovato
Bureau of State Parks

SECTION DESCRIPTION

These materials are divided into three sections: 1) Activities, 2) Follow-ups, 3) Resource Materials. The contents can be used singularly, in groups or in any way you see fit.

Section I consists of well-defined activities revolving around the Environment, Wildlife in the Environment, and Wildlife, Man and the Environment. Titles, concepts, objectives and material needs are arranged uniformly.

Section II houses follow-ups which are less-detailed activities that can be used to supplement Section I or as individual exercises. For your convenience, they have been categorized by discipline, but we encourage you to use your own creativity and not be jacketed by these groupings.

The final part, Section III, is a collection of resource aids including publications, periodicals and films that are given to enhance you and your teaching.

The Environment

Title:

WHAT ARE THE PARTS OF THE ENVIRONMENT? (I)

Concept: All things, living and non-living, have names.

Objectives: Upon completing this activity, the student will be able to:

Group the living things in the environment.

Group the non-living things in the environment.

Arrange the pictures according to the category given.

Materials: Old magazines, catalogues, Christmas cards, wrapping paper...scissors, construction paper (or similar backing), glue.

Activity: (1-2 hrs.) This activity makes an excellent forerunner to the Wildlife Lotto game. Pictures of living and non-living parts of the environment should be clipped and mounted on a backing.

The pictures can then be assorted into different groups (mathematically, a good way to explore set theory) or categories which you have listed on the board.

Some examples might include:

animals with feathers
animals with fur
animals with scales
living things
non-living things
things that were alive
things that were never alive
flowering plants
non-flowering plants

These pictures could be worked into a bulletin board display or used as flash cards for a part of the environment quiz. When the class has finished clipping the magazines, contribute them to a recycling center.

Title: **WHAT ARE THE PARTS OF THE ENVIRONMENT? (II)**

Concept: All things--living and non-living--have names.

Objectives: Upon completing this activity, the students will be able to:

Name four living parts of their environment.

Name four non-living parts of their environment.

Materials: Re-cycled keypunch cards or 3 x 5 filing cards. Masking tape or safety pins.

Activity: (1 hr.)

This exercise will help define the basic components of our environment. It also serves as a socializing activity and helps students to become more familiar with each other.

Being able to identify the parts of the environment is an important learning process for a youngster. Several approaches may be taken with this exercise. The living and non-living components of the environment may be used separately or they can be mixed. The names of these components (oak tree, gray squirrel, water, soil...) should be written on the computer cards and then one taped or pinned to the back of each student so that he is unaware of its identity. Each student then tries to solve the problem of naming the tag that he is wearing. This is accomplished by asking his classmates questions about the name on his card. These questions must be able to be answered with a simple "yes" or "no" reply. If his classmate answers "yes", he may ask the same person another question; but, if the answer to his question is "no", he must then go to another classmate with the next question. He continues his queries until he solves the name on the tag he is wearing. You may adjust the game so that competition is involved.

When possible use specific names (oak tree, instead of tree; starling instead of bird; cricket instead of insect). This will more thoroughly familarize the student with the environment.

FOLLOW-UP: What Animal Am I?

Another twist to this exercise is to use wildlife stamps (available from the National Wildlife Federation, 1412 16th St., N.W., Washington, D.C. 20036), or other animal pictures instead of names on the cards. With this activity the student answering the questions must be able to identify the picture on the back of his classmate.

Title: COLORING MY ENVIRONMENT

Concept: There are two basic parts of the environment--the living part and the non-living part.

Objectives: Upon completing this activity the student will be able to:

color the parts of the environment separating the living parts from the non-living parts.

Materials: Coloring sheets

Activity: (1/2 hr.) Using the following sketch, allow the child to decide how he might group and color these items including the categories of living and non-living things.

hawk
stream
tree
grass
flower
rock
cloud
deer
rabbit
snake
burrow
sun

p.a. wheimer

Title:

USING OUR SENSES TO LEARN ABOUT OUR ENVIRONMENT (I)

Concept:

We explore and learn about our environment through the use of our senses.

Objectives:

Upon completing this activity, the students will be able to:

Draw pictures showing the objects they felt in the "feely box".

List the senses which were used to identify the objects.

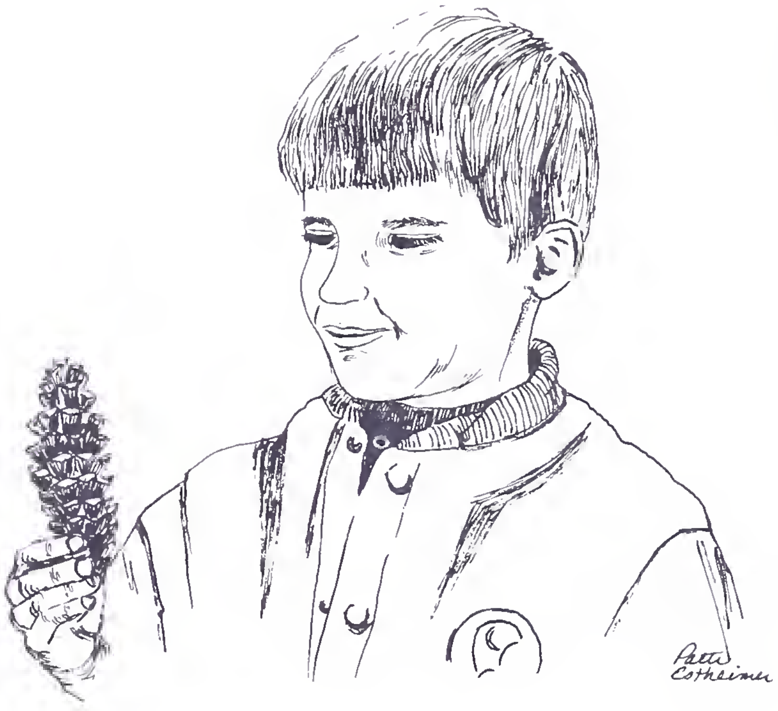
Write a poem or story describing how their senses function.

Activity: (2 hrs.)

Put several items in boxes. Pick unique things--something furry, smooth, sticky, etc. Have the students feel each object. Then ask them to draw an animal which represents all of the objects. It may be an imaginary animal.

Hide several objects, each having a different odor, in the classroom. For instance: a sponge soaked in vinegar, a spice scented candle, a bottle of vanilla, grape juice, a bottle of perfume, a rotten egg. Blindfold students. Individually, take blindfold off and have them try to find the location of the smell. Discuss why certain smells were found more easily than others.

Sit students in a circle, blindfolded. Give each student a different stick. Have them feel the stick for a few minutes. Then begin passing the sticks, changing direction occasionally. The object is for the student to recognize his original stick when it is passed to him through his use of touch, smell and taste.



pa rotheimer

Title:

USING OUR SENSES TO LEARN ABOUT OUR ENVIRONMENT (II)

Concept:

We explore and learn about our environment through the use of our senses.

Objectives:

Upon completing this activity, the students will be able to:

List the senses and describe how they can be used to interpret the environment.

List the sensory organs and describe their function.

Activity: (1-1 1/2 hrs.)

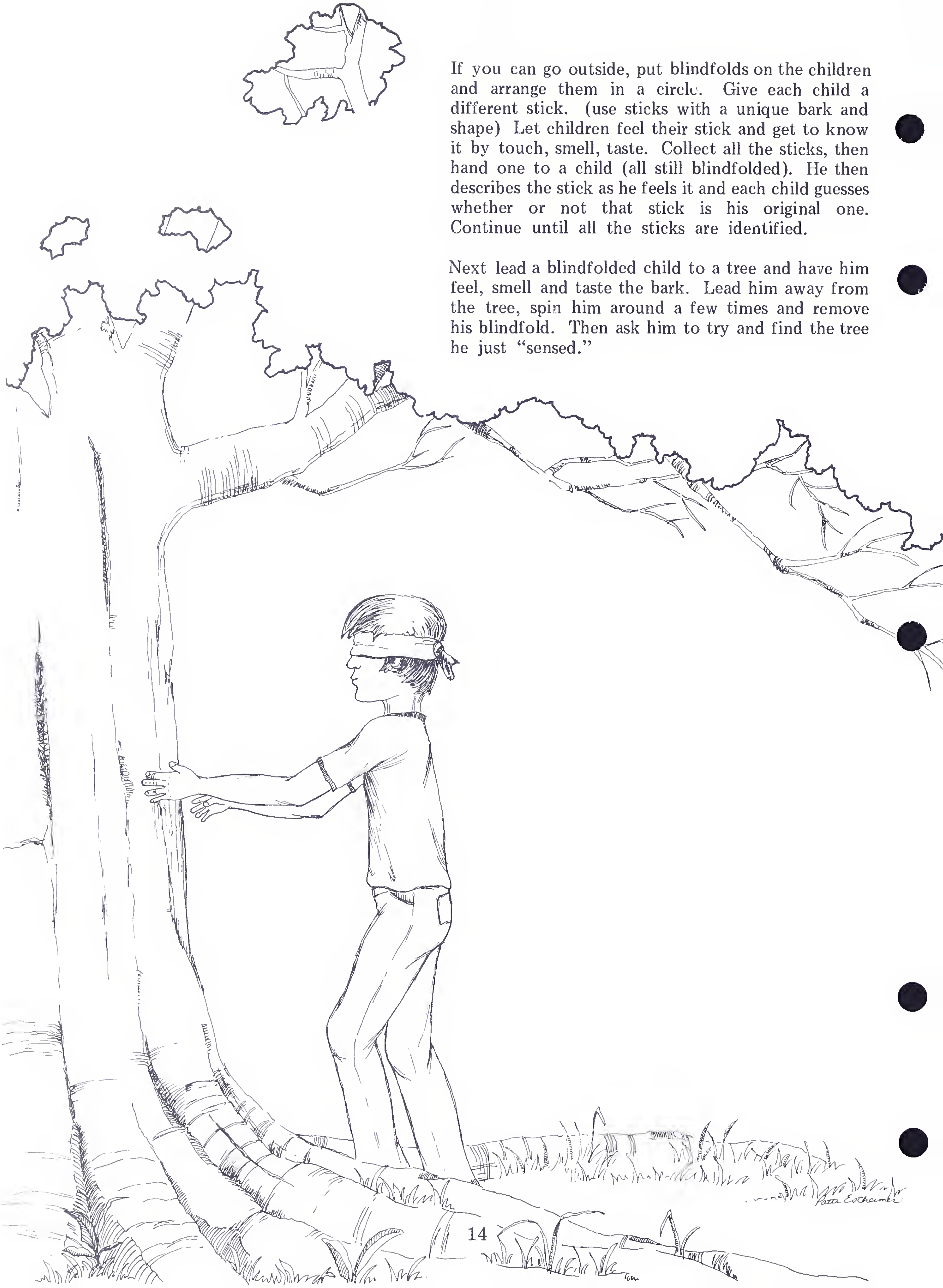
Review with your students, their five senses and their uses. Why do we need all of our senses? Explain how each sense shows us the different properties of an object.

Using an apple, review the five senses:
1. Touch--Blindfold children and have each one feel an apple. How does it feel? Smooth, soft, bumpy? If they think it may be an apple, ask them if it could be something else. Perhaps a pear, or a ball, or an orange? If it is not any one of these, why not? 2. Smell--How does it smell? The children are still blindfolded. Let them guess what it may be. Does it have a smell? Is it sweet, sour etc? 3. Hear--Are there any sounds coming from the object? Have a student bite into the apple. Does a noise result? Do any of your other senses come into play now besides hearing? (smell) 4. Taste—Have each student taste it, still blindfolded. What does it taste like? Do any of your senses come into play? (Smell, feel). 5. Sight--Show the apple. Yes, it is an apple. But ask the children how they knew before they saw it. They didn't need eyes to tell them. What one sense, or combination of senses, helped you decide it was an apple? We identify objects using each of our five senses. Each one helps us identify different properties of an object. Use two different kinds of apples (red and golden delicious).

Another exercise can be included by using a pet cat. Blindfold children and have each one touch the cat. Then remove blindfolds and tell the children that they are looking at a raccoon. The children will question this so tell them they have to prove to you that it is a cat. Have them write down the different properties of the animal that they discovered using their other four senses, and why these properties make the animal a cat. For instance, a cat has softer fur, skinny tail, makes a different noise, smells different from a raccoon, does not have a black mask, etc.

If you can go outside, put blindfolds on the children and arrange them in a circle. Give each child a different stick. (use sticks with a unique bark and shape) Let children feel their stick and get to know it by touch, smell, taste. Collect all the sticks, then hand one to a child (all still blindfolded). He then describes the stick as he feels it and each child guesses whether or not that stick is his original one. Continue until all the sticks are identified.

Next lead a blindfolded child to a tree and have him feel, smell and taste the bark. Lead him away from the tree, spin him around a few times and remove his blindfold. Then ask him to try and find the tree he just "sensed."



Title: **IS THAT SOUND NATURAL?**

Concept: Some sounds are natural and others are man-made.

Objectives: Upon completion of the activity, the student will be able to:

Name four man-made sounds in his environment.

Name four natural sounds in his environment.

Materials: Writing pads, pencils.

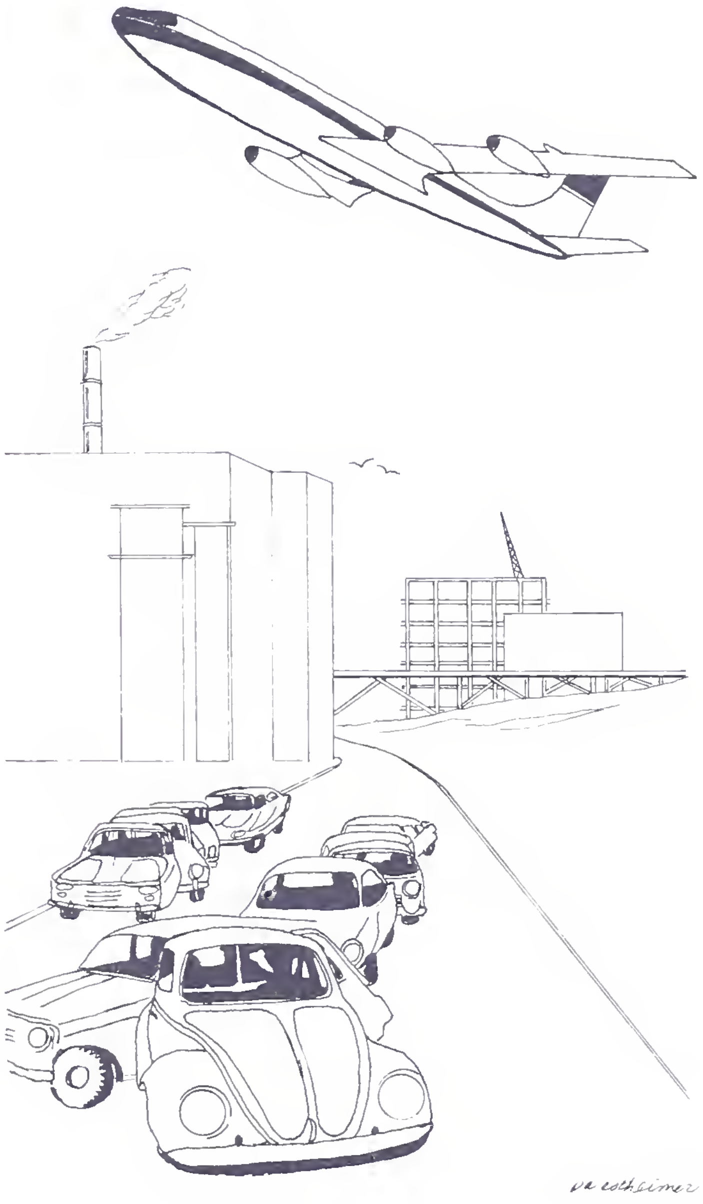
Activity: (1 hr.) This activity identifies the audio elements of our environment and illustrates how, sound-wise, man's presence is almost everywhere.

Select at least one place near the school where you can take your group to listen. Each student should have a note pad and a pencil. There should be two columns on their note pad, one entitled "Natural Sounds" and the other entitled "Man-Made Sounds." Have each student listen for ten minutes without talking to his neighbor. If possible distribute the students so that they will not be tempted to talk to one another. Ideally, each student would be situated so that he could not even see his classmates, but this is not always practical.

At the end of 10 minutes reassemble and have each student describe the sounds that she heard. Follow that listing with some questions like:

> Does the artificial sound you heard interfer with the wildlife of this area?
>
> Could this sound be eliminated from our community?
>
> Is the sound you heard likely to be a constant one, or is it something that would be heard only at certain times of the day?
>
> What are some of the natural things (trees, shrubs,...) that absorb artificial sounds?

By selecting different areas, you may be able to tailor this exercise to pick up certain sounds at different time of the day. The activity is designed to increase the perception of the students' ears since we have become conditioned to accepting a certain amount of background noise. Ask the students if they have ever experienced 100% quiet.



Title: **AIR IS STUFF**

Concept: Air is a gaseous state of matter and does occupy space and has mass.

Objective: Upon completing this activity, the student will be able to:

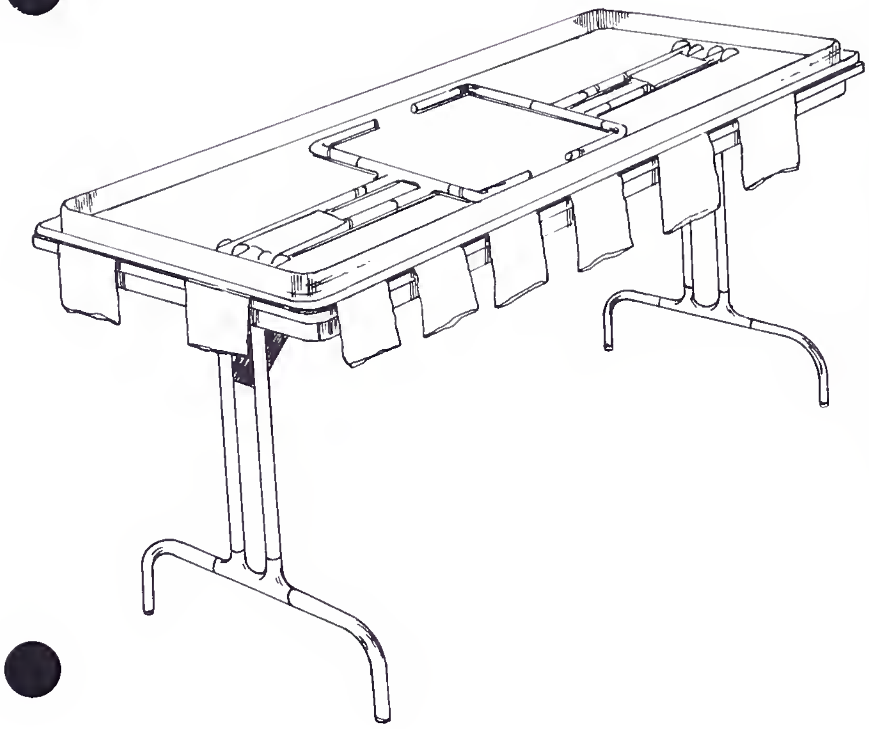
Describe, in writing, how air is a form of matter.

Define air pressure.

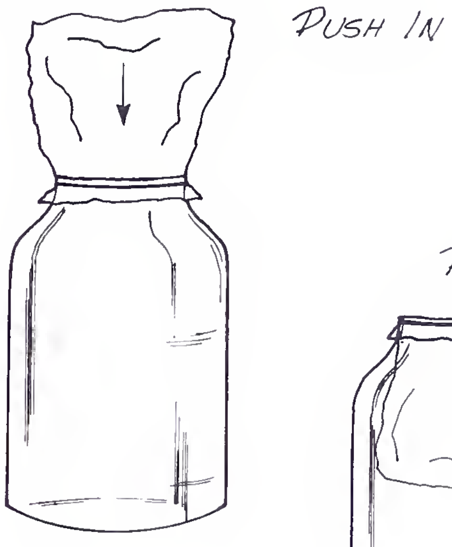
Materials: Two display tables, (2½ x 6 ft.), 24 plastic bread bags. One gallon wide mouth jar. Large plastic bag.

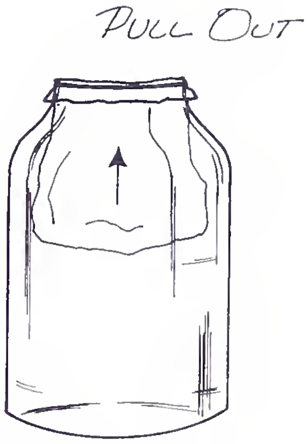
Activity: (1/2 hr.) Begin by talking about air as a form of matter and a non-living component in the environment. Talk about air pressure and relate it to ways in which students may be familiar with the term (tires, ballons, barometric pressure).

Place one table on top of the other so that the top surfaces are touching (see illustration). Between the two tables place the plastic bread bags with the open end extending outward a few inches. Select a student and have him lay on top of the two tables. Now have other students gather around the table and have them blow up the plastic bags. This will lift the student showing them that air is stuff.

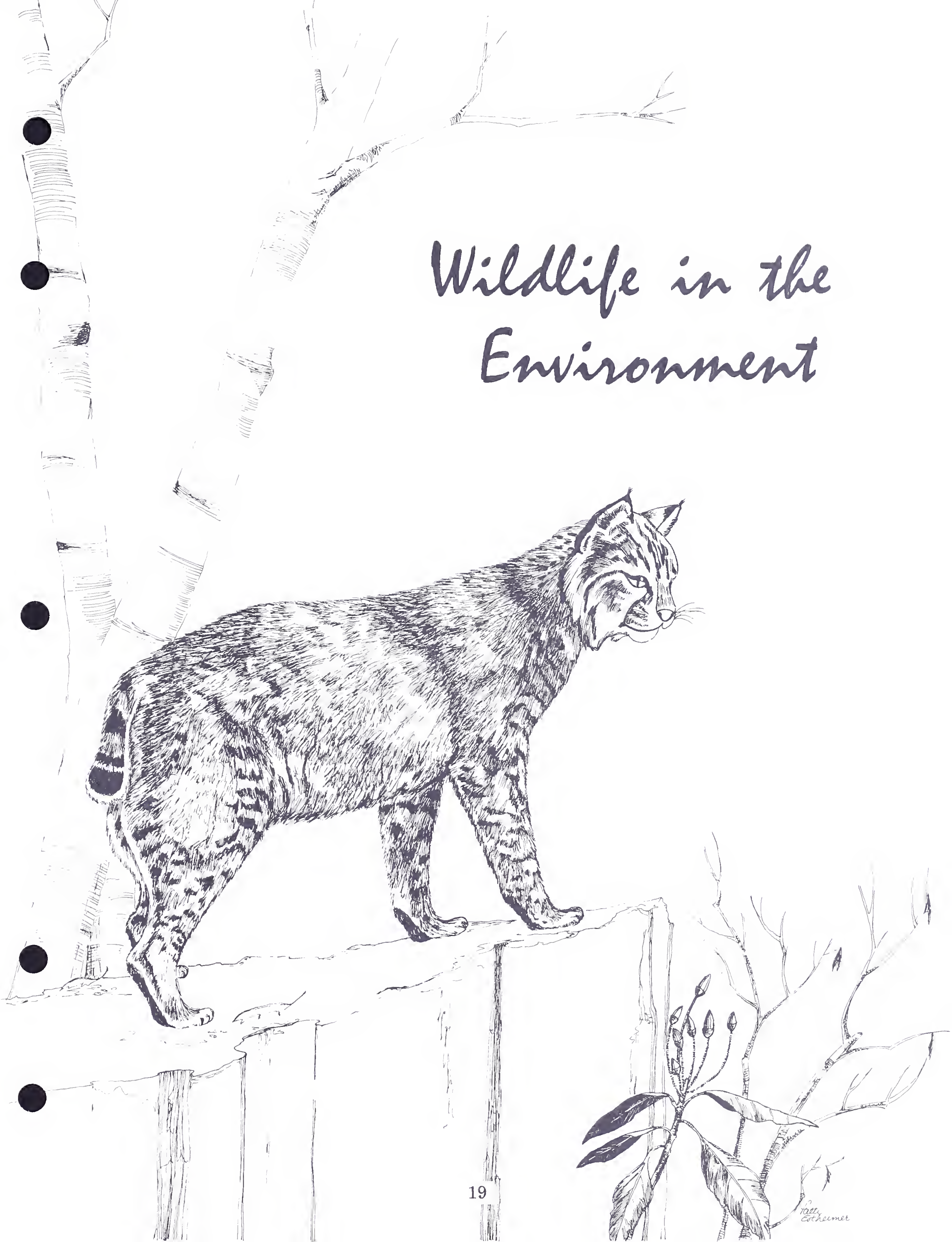


Using a one-gallon, wide mouth jar, insert a plastic bag into the jar with the open end overlapping the mouth of the jar. Place a strong rubber band over the mouth of the jar and the plastic bag (see sketch). Try to pull the bag through the mouth of the jar. Reverse the position of the bag so that the opening is over the mouth of the jar. Again connect the bag and the jar with a rubber band. Now try to push the bag into the jar. Both experiments show that air really is stuff.





Wildlife in the Environment



Title: **THE BASIC NEEDS OF WILDLIFE**

Concept: Wild animals and people have five basic needs.

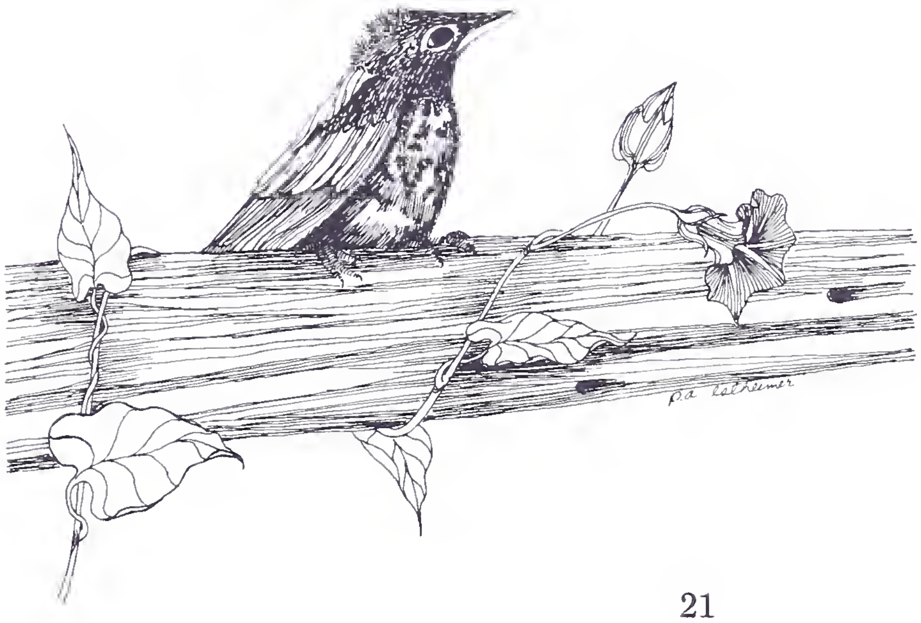
Objectives: Upon completing this activity, the student will be able to:

Describe in writing the basic needs of a wild animal.

Explain how these needs are the same for themselves.

Materials: Flip chart, revealing transparency, or chalk board. If you have access to a flip chart it's best to complete this activity outdoors as the "atmosphere" is more fitting. If not, the classroom will do, but desks and tables should be cleared to provide ample open space. The flip chart should include (on separate pages) FOOD, WATER, OXYGEN, COVER (SHELTER), and LIVING SPACE.

Activity: (1/2 hrs.) The activity will illustrate how all living things--even humans, have the same basic life requirements: FOOD, WATER, OXYGEN, COVER (SHELTER), and LIVING SPACE. These five terms should be listed separately on a flip chart, or noted on the board as the students answer the question "What Are the Needs of Wildlife?" After listing these needs, consider all of them in terms of a particular animal. Maybe you have a mounted specimen of a rabbit, pheasant, red-tail hawk, etc. Work into story from the needs of this animal. Use charts or pictures of the animal in question. If it is a bird, work into your discussion recordings of its voice--maybe even a film can be used in conjuction with this activity. The Game Commission's Wildlife Note series may be helpful (see references). Then consider the individual needs of your students. Are they different from those of wildlife?



Box Turtle

Title: **WILDLIFE LOTTO**

Concept: Wild animals have names.

Objectives: Upon completing this activity, the student will be able to:

List the names of nine animals used in the lotto game.

Write a story about one of the animals used in the lotto game.

Materials: Wildlife photographs taken from magazines *(Pa. Game News, Outdoor Life, Field and Stream, Wyoming Wildlife...)*. Scissors, glue, ruler, colored pencils or crayons, 3 x 5 cards.

Activity:
(Construction: 1-2 hrs.)
(Game periods: 1/2 hr.)

The game is designed to develop the visual identification of wildlife. Also socialization through classmate interaction will be developed.

The activity involves the construction of the lotto board and cards. Pictures of wildlife should be clipped from magazines listed or other sources. Students should be encouraged not to destroy magazines having reference value, but most families subscribe to one or more magazines that are suitable for clipping.

The layout of the board should be as shown.

1	2	3
4	5	6
7	8	9

Game board cards (6)
Small playing cards (54)

Each student will need nine pictures of animals to complete his lotto board. Additionally, for each picture placed on the lotto board a 3 x 5 card is needed with a picture of the same animal. The card need not reflect an identical picture of the one found on the lotto board, but it must be of the same animal. Groups of 4 to 6 students would make up the group playing the game. The cards for each board would be placed into one deck. After shuffling one student would turn over the top card and name the animal shown. The first student to identify that animal on his board would take the card and cover that animal with it. Then that student would pull the next card, name the animal, and the group would continue to play until one student had all his animals covered. The student to first cover all the animals on his board is the winner of the game.

Instead of making cards and lotto boards out of clipped magazines, they may be constructed out of wildlife stamps available from the *National Wildlife Federation (1412 16th St., N.W., Washington, D.C. 20036).*

Title: **THE FOOD WEB GAME**

Concept: All parts of the environment are interdependent.

Objectives: Upon completing this activity, the student will be able to:

Draw a picture of a food web.

Explain (in writing) how plants, plant-eaters and animal-eaters are interdependent.

Materials: A large ball of string or colored yarn and name signs which are put on string to be worn around the neck. On the signs letter and/or draw the following characters:

soil
dandelion
blueberry
earthworm
steer
deer mouse
robin
cottontail rabbit
quail
barn owl
red fox
grasshopper
white-tail deer
mountain lion
man
water
sunlight
air
black snake
red-tail hawk

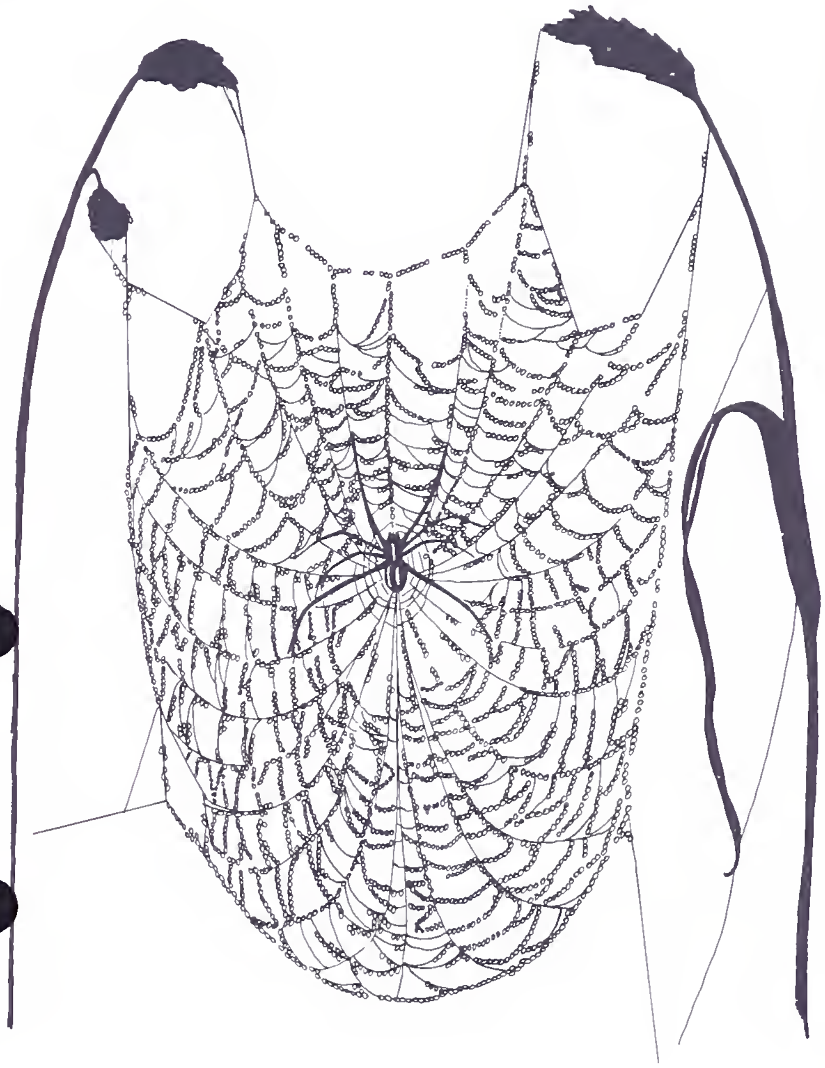
Activity: (1 hr.) Ask pupils to use these names to construct models of two or three simple food chains, and then convert them into a food web.

Assign a card to each student. Starting with the sun, connect the chain to green plants by asking the two students to hold a length of string between them. Next connect one of the herbivores to the plants; follow this with a carnivore linked to the herbivor. At first the components will depict simple food chains, but as more and more parts are added, cross-links begin to be evident and the food web concept is developed. At the outset, it is best to place the pupils representing sun and plants centrally, and then allow the remainder of the web to develop around them.

QUESTIONS: In a natural environment, if all the members of a particular species, such as a grasshopper are removed from the food web, what would be the effect. This point can be emphasized by removing the "grasshopper" from the model.

In a natural community, what would be the effect of removing all predators (barn owl, red fox...) from the food web?

As part of the food web, how does man differ from all other organisms? Make sure students realize that



man attempts consciously to manipulate the components which make up the web; and that man alone has the ability to understand the complex interdependencies, and therefore has the obligation and responsibility to act as steward in maintaining the balance of the whole web.

Continue the exercise and have the students make lists of the foods they ate during the previous day. The list should be detailed and it should include every type of food product used. Direct the discussion so that man's stewardship of the environment will be demonstrated. Consider these questions:

(1) What plants or plant products are included in the list?

(2) What animals provide the meat foods?

(3) What do these plants and animals need to survive?

(4) Are any of these food sources threatened by pollution?

(5) Are the sources of food for plants and animals threatened in any way? As these food sources are in danger, how might man be affected?

(6) What can man do to protect his food supply?

PREDATOR PREY RELATIONS

Title: Predatory and prey species are dependent upon each other.

Objectives: Upon completing this activity, the student will be able to:

Describe in writing the affects of predators on a prey population and vice-versa.

Name three predators and three prey animals.

Construct and graph and explain the results of the data accumulated.

Materials: 100 poker chips (50 white, 25 red, 25 blue), plastic bag, graph paper and colored pencils.

Activity: (1-2 hrs.) This activity is a hands-on modeling approach to predator-prey relations. The simulation is easy enough, but good instructions are essential to avoid confusion.

A general discussion of predation should preceed this exercise and various examples should be noted.

The colored chips will represent different animals. White chips will represent cottontail rabbits, red chips red-tailed hawks and blue chips great-horned owls. These species illustrate the day long pressures of predation with hawks being diurnal and owls being nocturnal.

The plastic bag represents the ecosystem where these animals live and interact.

Begin by dividing the students into groups of four. One student will pull the chips (two at a time) from the bag; one will tally the results; one will hold the survivors and the fourth student will hold the deceased animals. A generation is completed when all the chips are removed from the bag.

Start with forty rabbits, twenty hawks and twenty owls. Mix these eighty chips thoroughly in the plastic bag (a bread bag works nicely). Select the chips, two at a time, until all chips are removed from the bag, and then tally the results using the following guidelines. When two chips are drawn the combinations my be:

prey and prey = survival for prey

prey and predator = survival for predator, death for prey

predator and predator = death for predators

The students keeping the survivors and/or the deceased collect these chips accordingly. The student keeping the records should tally the total surviving rabbits, hawks and owls for each generation.

In order to repeat the exercise the survivors must be returned to the ecosystem according to an assigned birthrate. Use the following birthrates for the different groups.

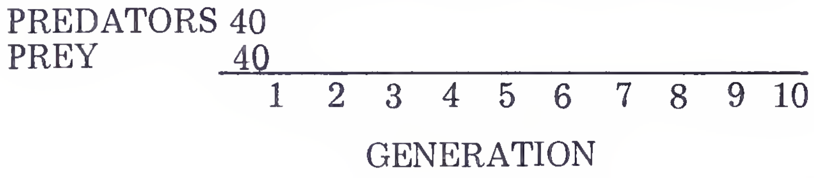
For each chip returned to the next generation add:

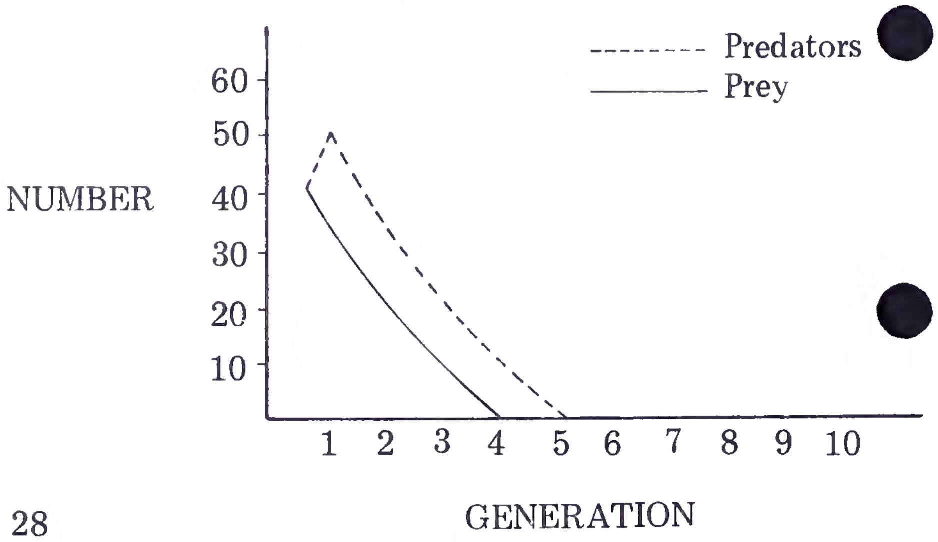
	Predator	Prey
Group I	1	1
Group II	2	1
Group III	1	2

Group I would add 1 predator chip for each surviving predator, and 1 prey chip for each surviving prey.

These three different assignments will give you three separate results which will work into your discussion. The preceeding instructions require twelve students to complete the three groups. Most classes are large enough to have two student groups working on each assigned birthrate.

After the survivors are returned to the bag, repeat the drawing for the second generation and continue, if you have enough survivors, for ten generations. Record all information and then graph the results.

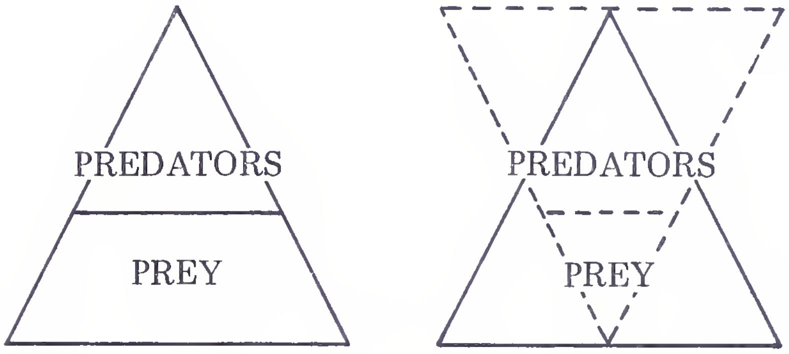




Your summary discussion should include several points.

(1) Predatory dependence on prey species shows a time lag of one generation. When prey numbers fall you can predict that the predators will follow the crash. The reverse is also true.

(2) Small numbers of prey animals cannot support large numbers of predators. This violates the graphics of the biological food pyramid.



(3) Equal numbers of prey animals cannot support equal numbers of predators. Same theory as No. 2.

(4) In reality there are some variables that were not included in this exercise.

   (a) Age and sex differences of predators and prey were not considered. These factors affect predation.

   (b) Each prey animal had an equal probability of being captured which eliminates the "survival of the fittest" theory.

   (c) No provision was made for the prey to secure food. Their only requirement was to pair with another prey to survive.

   (d) The only limiting factors to be considered was securing food (predators) or escaping predation (prey).

(5) A more accurate birthrate would have to be assigned for the exercise to be more valid.

Title: LIVING THINGS NEED EACH OTHER

Concept: Wild animals are dependent on each other and their environment.

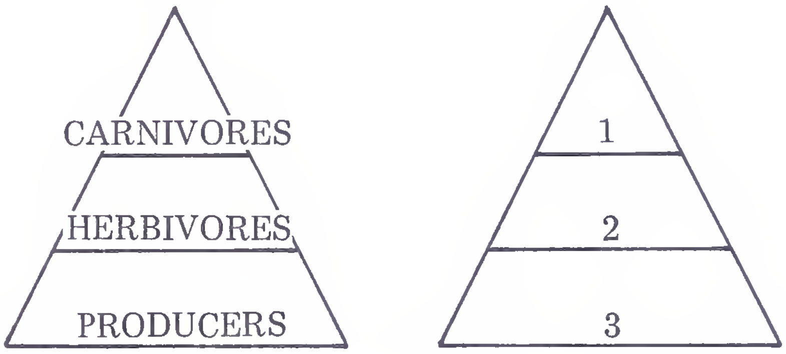
Objectives: Upon completing this activity, the student will be able to:

Describe in writing predation and list three examples of predatory and prey species.

Describe verbally and graphically a food chain and the transfer of energy through that chain.

Describe in writing the words habitat, community and home.

Materials: Cards (recycled keypunch or 3 x 5 file cards) with the following titles: wild oats (10), maple seed (10), beechnut (10), acorn (10), deer mouse (14), red-tailed hawk (6). Flip chart or poster board with the following copy:



Activity: (1 hr.) This activity is a good follow-up to "The Basic Needs of Wildlife." Distribute all cards to the students. (If less than sixty children are involved, give more than one card to the students.) Introduce the activity by reviewing the individual needs of wildlife in their environment. Then separate the deer mice and red-tailed hawks into groups.

At this point, you may wish to remark how unlikely this is to happen as these animals, and others, would be spread more evenly across their environment. Introduce the term habitat and differentiate it from environment. Habitat, having a more specific definition, implies a home for a particular kind of animal, whereas the environment consists of all the parts of a locale and includes, in all probability, more than one habitat. In talking about the needs of a deer mouse you might mention how they need Food, Cover, Water, Oxygen and Living Space. Of course, water needs may be met without free drinking water (they secure their moisture from the food they eat) and cover or shelter may be fulfilled over a very small area so that the habitat of a deer mouse includes only a small range.

Now, make some remarks about the red-tails. Comment on where they might be found in relation to the deer mice. Talk about their needs--like places to perch or nest, places to feed--and now let's interact the two. Ask your group what they might suspect to be the food of a red-tailed hawk. Undoubtedly someone will suggest that deer mice are preyed upon by red-tails, and at this point I'm sure a few sounds or giggles or some reaction will be noted among your 14 "deer mice." Describe a feeding flight of a red-tail, how it soars in the open field looking for deer mice and, after finding one, plunging to the earth and, perhaps at this point you want to have him miss a deer mouse (the six red-tails do not actually pursue the deer mice--this is a descriptive exercise unless you wish to modify it in some way; however, order may be a problem.) But if the red-tail is to survive, he will have to find enough mice to live and eventually six red-tails will capture six deer mice. Ask for volunteers for the deer mice and take the first six that give you their card. (For convenience it's best to have a helper at this point.)

These volunteers should be likened to deer mice that are not quite so alert. The thinking here is that fourteen students are involved in a discussion about what red-tails feed upon. If, after hearing that discussion, you still have six volunteers (that essentially are volunteering to be eaten), they probably can be likened to the "less fit" of the mouse population. Be watching for those two "mice" that are the most interested in surviving as they will probably be shying away from their group.

Now you will be left with 8 mice and 6 hawks. Comment on how hawks will not always feed three times a day, or two times a day, and that animals will not feed at breakfast, lunch or supper. You may comment on the change on the weather and how it may affect a red-tail as during rainy periods they would stay on the roost or perhaps high winds would prevent them from feeding on a particular day.

But eventually they will again have to seek an energy source and the mice population represents their food or energy source. This time select six additional mice to supply the food needs of our six red-tails saving those two students that are most resistant. They represent the most "fit" of the mouse population. Now we are left with six red-tails and two deer mice and we must look at some of the limiting factors of the hawk population.

Comment on how one hawk may be extremely weak and perhaps sick and with a shortage of food may now succumb to starvation. Remark how accidents also affect animals and that medical attention is not feasible for wildlife; therefore, a hawk that inadvertently strikes a limb of a tree and is injured will probably die. Also, mention disease and how wildlife diseases are responsible for culling some of our wildlife resources. Therefore, we have removed three of our red-tails, and could remove another by having it strike an automobile, or an electric line, or an inconsiderate hunter may shoot one--which is against the law.

Now you have reduced your population of red-tails and deer mice to two of each. For interest, you might ask if they want to be a "pair" of red-tails or deer mice. In any case with few mice available for the hawks to eat, the remaining birds will move on to better hunting grounds and with little competition from other mice the surviving deer mice will be able to thrive in their meadow.

Introduce the biological pyramid at this time and quiz the group about what levels the mice and hawks occupied. At this point the inter-relationships of animals is obvious, and work that into the discussion.

Now ask them what was missed in the discussion. (We missed the green plants). Talk about the importance of green plants. Work into the talk the non-living parts of the environment (sun, water, carbon dioxide...).

Then to show how (in a healthy environment) green plants outnumber herbivores which in turn outnumber carnivores, have a hand showing of the different plants and animals listed on the cards. Start with each plant type (acorn, beechnut...) and then the total number of plants. Next have a show of the deer mice and finally the red-tailed hawks.

This visual demonstration will support the flip chart showing the biological pyramid with plants at the base and carnivores at the smaller apex.

Finally, with the graph showing the three numbers, quiz the students on what level their card represented with green plants (wild oats, maple seed) being No. 1; herbivores (deer mice) No. 2 and carnivores (red-tailed hawks) being No. 3.

Title:

ALL ABOARD ON YOUNG NOAH'S ARK!!

Concept:

All living creatures have certain characteristics which assist them in survival.

Objectives:

Upon completing this activity, the student will be able to:

List three characteristics that are unique to the animal that he has selected to board Young Noah's Ark.

List five other animal characteristics learned because of this game.

Write a plan describing how to board Young Noah's Ark.

Write a story or poem about the boarding of Noah's Ark.

Activity: (1-1 1/2 hrs.)

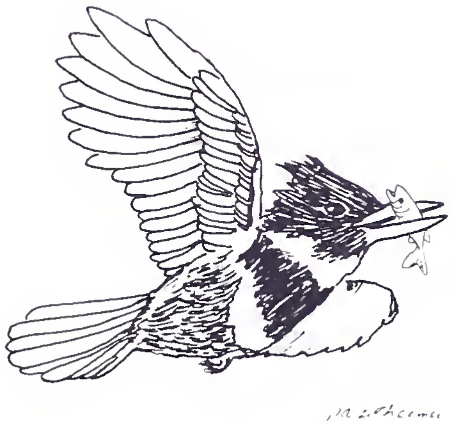
This simulation study will be introduced by the teacher with a story about how Noah's son (Young Noah) decided to build an ark similar to that of his father. Young Noah however, had a crisis. He did not have enough wood in his Forests, therefore his ark could not be as large as his father's.

Because of this situation, Young Noah could not take all of the animal species that his father did, so a decision was made to take those animals that could provide good reasons for going, in case of another flood.

The teacher will let each of the students select an animal to research and mimic during the simulation study. Teams of two or three students would be permitted to research one animal if necessary. The students are to find out as much about the animals as possible. Some questions that the teachers may want them to investigate are:

1. What does my animal eat?
2. Where does my animal live?
3. What other animals does he live with?
4. What animal family is he in?
   (mammal, bird, reptile, amphibian, fish)
5. What is good about this animal?

The teacher should try to redesign desks and chairs in the classroom to be shaped like an ark.



In the center of the design should be a doorway. On each side of the doorway the teacher should place a bulletin board.

The simulation game involves Young Noah (the teacher) sitting by the door to the Ark. Each child, one by one, or in a team, presents herself to Young Noah (i.e. the child selected as a rabbit would hop up to Young Noah at the driveway, then turn to the other "animals" and state the reasons why a rabbit should go abroad the ark.) After listening to each animal, Young Noah would either "OK" the animal for boarding or turn it down, depending upon the amount of information the child gave. After each of the students get their animal accepted or rejected, they pin a colored picture of that animal on one of the two bulletin boards. (One board for those animals accepted, one for those animals rejected). At the conclusion of the presentation, the teacher initiates a discussion with the children. The teacher may say, "Looking at both bulletin boards, let's try to find out if Young Noah made the best selections." (i.e. would it have been better to pick a cow or dog instead of a mountain lion or weasel?) Or "What other materials are available in our environment that Young Noah could have used to make his Ark larger?"

FOLLOW-UP: Upon completion of the discussion, the teacher would permit the students who selected animals that were rejected to continue researching their animal or to select and research a new animal. After ample time was alloted for this activity, the teacher should then repeat the simulation game until all "animals" are aboard the Ark.

Title:

ANIMAL COMMUNICATION

Concept:

Animals communicate differently than people, but they do communicate.

Objectives:

Upon completing this activity, the student will be able to:

Describe, in writing, three ways animals communicate.

Define communication.

Select one animal and write a story about how that animal communicates.

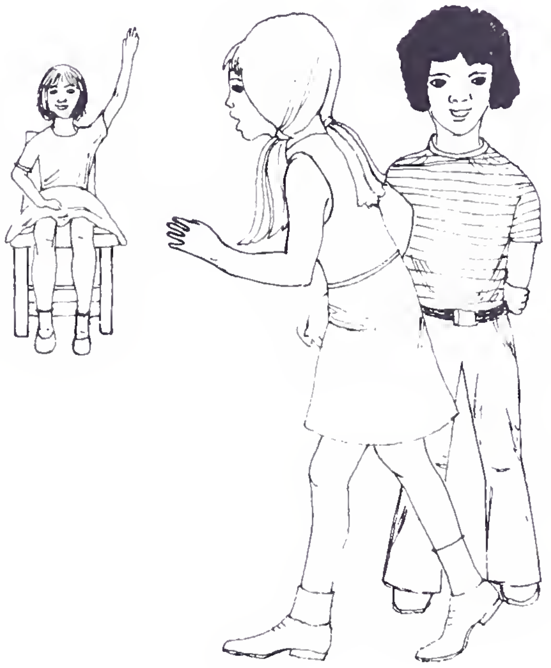
Materials:

Some strong smelling, but safe materials: moth balls, vinegar, cedar chips, deodorizer, cinnamon, citronella, smelling salts. Small jars or cannisters..

Activity: (1/2-1 hr.)

Through this exercise the students should become more aware of the importance of communication, and some of the problems encountered by wildlife. Actually, what we have just described as a problem is adapted to by the wildlife species and becomes more a matter of our human superiority than a problem for any particular animal.

Begin by directing your students to organize in groups of six. Make the instruction a hurried one, and note how quickly some groups seem to form as compared to the time necessary for others to assemble. Whenever possible, make comments about their behavior and compare their actions to wildlife. For instance, if your students would have been a group of young turkey poults and you were the mother hen, your command to do something would have to be followed quickly if the poults were to survive. Your command may have been for them to hide in order to find protection from danger like a hawk, or a fox, or another predator. Point out how the slow forming groups would have possibly been removed from the rest of you by a feeding hawk or maybe a fox. Be very careful not to imply that this predator is bad as he must find food in order to survive. In any case, whenever possible do make comparisons between your students' actions and the behavior of the wildlife around you.



After groups of six have been formed instruct the group to arrange themselves in a chronological order according to their birthday--without talking. The beginning of the line should be occupied by someone whose birthday is nearest the beginning of the year or January, while the end of the line should be occupied with a birthday late in the year. Students having the same month for a birthday should be arranged with the date closest to the beginning of the month first. You might make this a contest to see which group is able to arrange themselves the fastest. Remember, no talking.

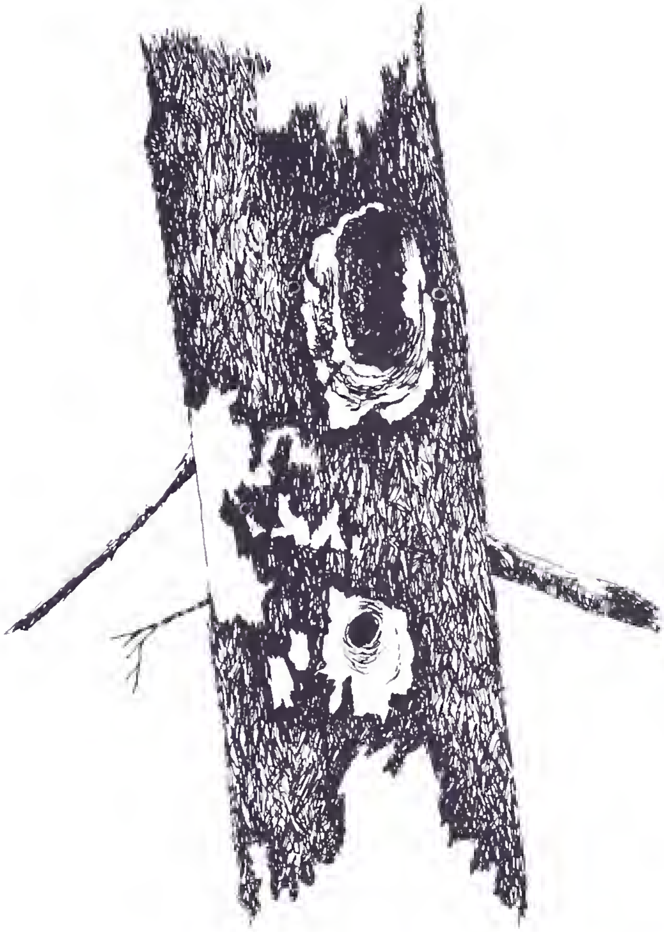
By now you will be able to make some comparisons with the wildlife of your community. One big difference between animals and people is that animals cannot talk. Talking is an effective way of communicating. Your students probably never thought much about the inability of animals to talk which results in a problem for them to communicate. At this point it should be noted that all animals do not communicate freely as some are more solitary than others. You might memtion that flocks of winter birds (like chickadees or titmice or nuthatches) feeding together in a loosely knit flock are constantly communicating, whereas a fox or a black bear may be more solitary and have less need to communicate with others of their kind. After making some comments along these lines, explain the importance of animal scent. Almost all animals (mammals at least) have a better sense of smell than man. Using the substances mentioned under materials, "plant" some of these cannisters around the room, or if you are outside, at different locations. These scents will illustrate different kinds of animals, and you want to try to find the homes of these animals. (If cinnamon represents a squirrel put it near a tree, vinegar a rabbit near some shrubs ...).

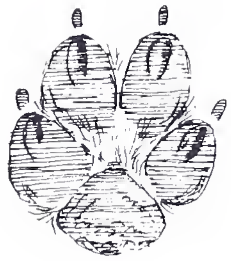
We will assume that the scent once discovered illustrates where that animal lives. Now all of this planning cannot be accurate, but the idea of smell as an important sense for wildlife will be illustrated. If you are outside you might let the smell of vinegar be represented by a squirrel, and by rubbing or pouring some vinegar on the trunk of a tree you will be able to nearly duplicate a squirrels home. You are limited only by your imagination.

At this point list all the different kinds of animal communication that the class can describe.

Now that you're illustrated the importance of being able to talk as a form of communication, comment on how many problems we have in understanding each other. The classic example may be to start a phrase at one end of your group and have that phrase filter throughout the rest of the group by letting class members whisper it to one another. A good phrase to pass on is, "If you don't care about wildlife, who will?"

Title:	ANIMAL "SIGNS"--BECOMING AN OUTDOOR DETECTIVE
Concept:	Animals leave different "signs" that indicate their presence in an area.
Objectives:	Upon completing this activity, the student will be able to: Identify three different kinds of animal "signs" found near the school or his home.
Materials:	Plastic transparencies, marking pencils, overhead projector.
Activity: (1 hr.)	This is a good winter activity after a light snowfall. Or, if there is a stream near the school, you can get some nice results by raking an area along the stream to collect different animal tracks. Also, the students could take the plastic sheets and pencils home and collect animal tracks for the next day. The main idea is to find different animal tracks, claw marks on trees, broken nut shells on a stump (squirrel) or other animal signs and trace them onto transparencies. Back in the classroom the student projects his discovery for the remainder of the class which tries to guess what it is. A follow-up could include a more detailed study of the animal in class. Also, if two or more students have the same animal sign, have them compare the places where they found them. They may be able to suggest something about where this animal lives.





Title: **MAKING A TRACK TRAP**

Concept: Animals can be identified by their tracks.

Objectives: Upon completion of this activity, the student will be able to:

Identify five different kinds of animals by their tracks.

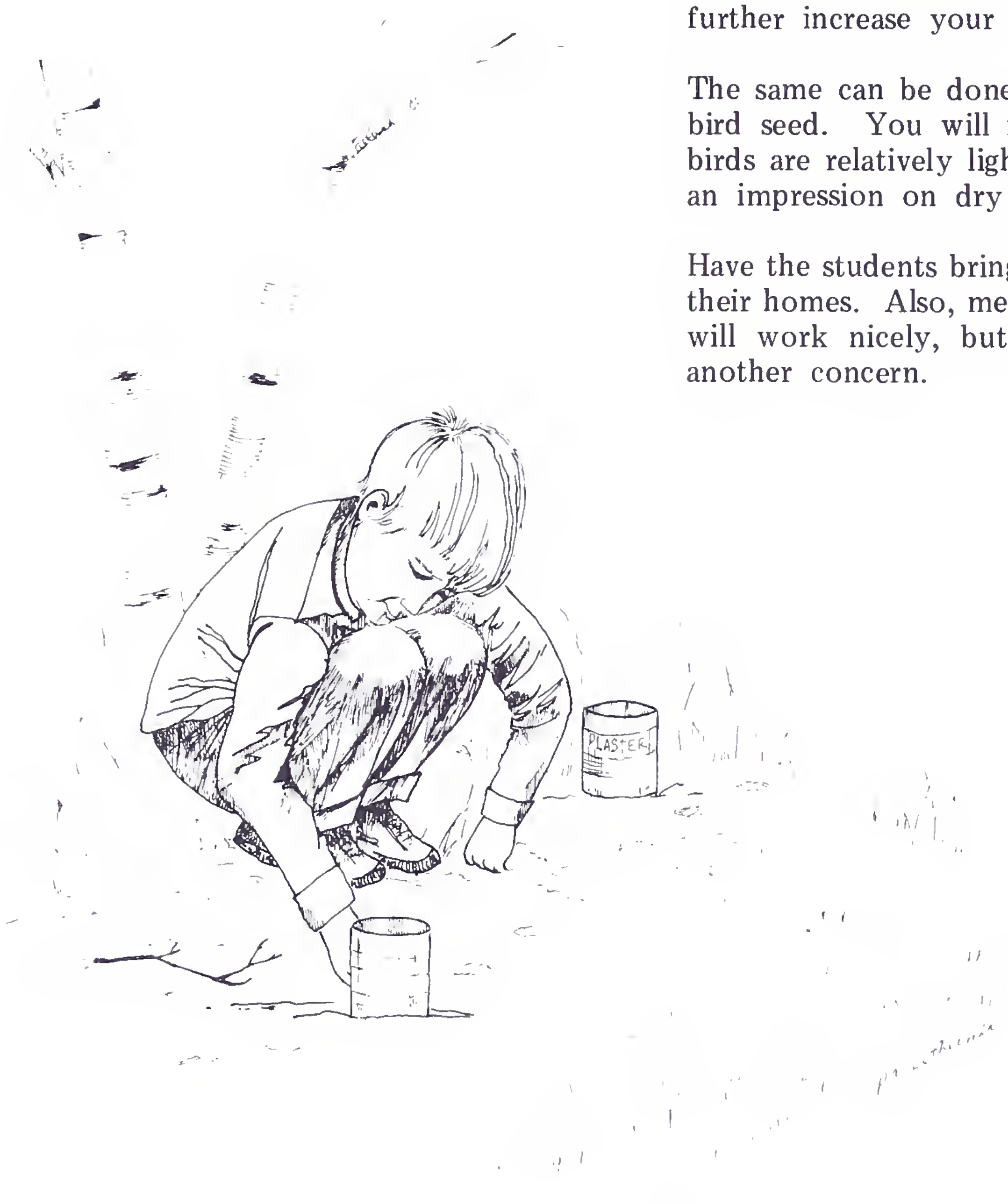
Materials: Plaster of paris, water, metal form (coffee can), small brush.

Activity: (1 hr.) Making plaster casts of animal tracks has been described in so many sources we won't take space to repeat it, but there are some things you can do to get the tracks to start the exercise.

If there is a stream nearby, scrape and rake smooth an area adjacent to the stream. Since animals (raccoons, opossums, mink...) travel next to the stream your chances of getting prints are greatly improved. By baiting the area with cod liver oil you further increase your chances.

The same can be done with an open area and some bird seed. You will need to moisten the site since birds are relatively light and will not make much of an impression on dry ground.

Have the students bring casts of tracks they find near their homes. Also, melted wax from a burning candle will work nicely, but the danger of fire becomes another concern.



Title: **A FOOD PYRAMID MOBILE**

Concept: Living things are interrelated.

Objectives: After completion of this activity, the student will be able to:

Draw a picture of a food pyramid.

Construct a mobile using animals and plants showing how they are interrelated.

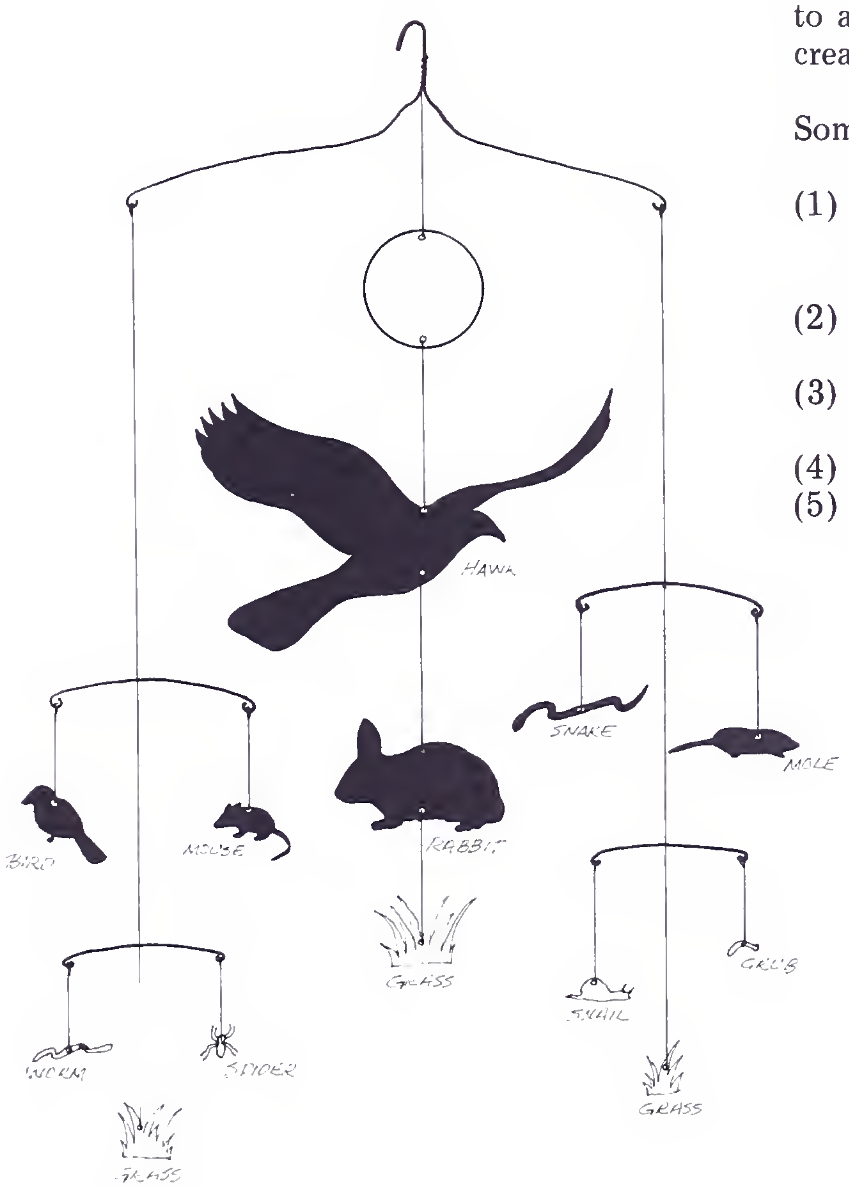
Materials: Pictures of producers, herbivores, carnivores, decomposers, wire (coat hangers), string, scissors,glue wood dowels (optional).

Activity: (1-1 1/2) This activity will help to incorporate psychomotor skills to construct the model. Skills in levers and balances are also involved.

Students are to construct a mobile of a simple food pyramid illustrating their understanding of food chains and webs. Students should be given adequate directions but then allowed to proceed freely in trying to accomplish their objectives allowing them as much creativity as possible.

Some questions to consider are:

(1) As you observe your mobile from top to bottom, what is the relationship of the number of organisms at different levels.
(2) Where are the producers? Primary consumers? Other consumers?
(3) What happens when you remove one of the producers?
(4) What is the final consumer?
(5) Where should the sun be incorporated into the mobile?



Title: **DO YOU KNOW YOUR BIRDS?**

Concept: Birds are a distinct group of animals.

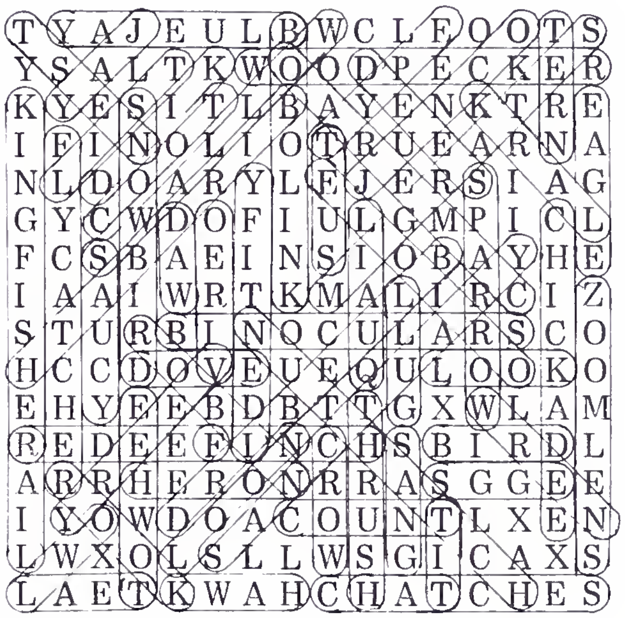
Objectives: After completing this activity, the student will be able to:

List the names of 10 birds.

Activity: (1/2 hr.) A bird is a distinct animal having feathers, wings and is hatched from an egg. There are about 8600 species of birds.

This wildlife word game is designed as a problem solving exercise which reenforces the names of wild animals.

These word games make practical "additional" or "special" activities for different situations that arise during a school year.



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T Y A J E U L B W C L F O O T S
Y S A L T K W O O D P E C K E R
K Y E S I T L B A Y E N K T R E
I F I N O L I O T R U E A R N A
N L D O A R Y L F J E R S I A G
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F C S B A E I N S I O B A Y H E
I A A I W R T K M A L I R C I Z
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R E D E E F I N C H S B I R D L
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I Y O W D O A C O U N T L X E N
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DO YOU KNOW YOUR BIRDS?

Looking for a different way to spend a summer's day? Go bird "hunting." Take along binoculars, a camera, and a pad to jot down the names of birds you see. Who knows? You may spot a yellow-bellied sapsucker!

1. Binoculars
2. Bird
3. Bird Bath
4. Bluebird
5. Bluejay
6. Bobolink
7. Camera
8. Chat
9. Chickadee
10. Coot
11. Count
12. Crow
13. Daw
14. Dove
15. Eagle
16. Eggs
17. Feeder
18. Finch
19. Flycatcher
20. Gull
21. Hatches
22. Hawk
23. Heron
24. Identify
25. Jay
26. Junco
27. Kind
28. Kingfish
29. Lark
30. List
31. Look
32. Loon
33. Migrates
34. Nest
35. Nuthatch
36. Oriole
37. Owl
38. Quail
39. Rail
40. Robin
41. Rook
42. Sanctuary
43. Sang
44. Saucy
45. Seed
46. Snowbird
47. Sparrow
48. Suet
49. Swallow
50. Teal
51. Tern
52. Thrush
53. Tit
54. Towhee
55. Type
56. Veery
57. Vireo
58. Woodpecker
59. Wren
60. Zoom Lens

T	Y	A	J	E	U	L	B	W	C	L	E	O	O	T	S
Y	S	A	L	T	K	W	O	O	D	P	E	C	K	E	R
K	Y	E	S	I	T	L	B	A	Y	E	N	K	T	R	E
I	F	I	N	O	L	I	O	T	R	U	E	A	R	N	A
N	L	D	O	A	R	Y	L	E	J	E	R	S	I	A	G
G	Y	C	W	D	O	F	I	U	L	G	M	P	I	C	L
F	C	S	B	A	E	I	N	S	I	O	B	A	Y	H	E
I	A	A	I	W	R	T	K	M	A	L	I	R	C	I	Z
S	T	U	R	B	I	N	O	C	U	L	A	R	S	C	O
H	C	C	D	O	V	E	U	E	Q	U	L	O	O	K	O
E	H	Y	E	E	B	D	B	T	T	G	X	W	L	A	M
R	E	D	E	E	F	I	N	C	H	S	B	I	R	D	L
A	R	R	H	E	R	O	N	R	R	A	S	G	G	E	E
I	Y	O	W	D	O	A	C	O	U	N	T	L	X	E	N
L	W	X	O	L	S	W	L	W	S	G	I	C	A	X	S
L	A	E	T	K	W	A	H	C	H	A	T	C	H	E	S

Title: **DO YOU KNOW YOUR MAMMALS?**

Concept: Mammals are a distinct group of animals.

Objectives: After completing this activity, the student will be able to:

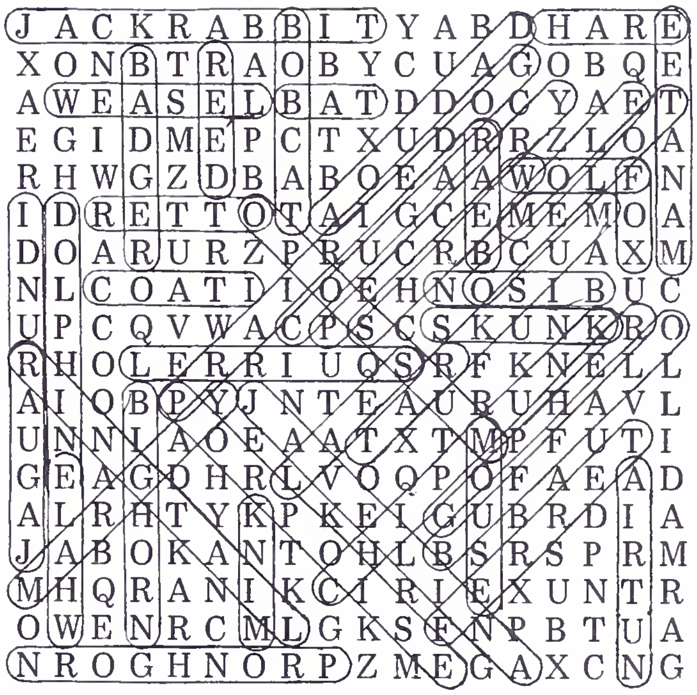
Write the names of 10 mammals.

Activity: (1/2 hr.)

A mammal is a distinct animal having hair (sometimes not very evident and in some whales it is absent after birth) and mammary glands. Prior to birth the young are nourished through a placental membrane in the female. There are about 5000 species of mammals. Try to find out more about whales by reading a book or visiting a museum.

This wildlife word game is designed as a problem solving exercise which reenforces the names of wild animals.

These word games make practical "additional" or "special" activities for different situations that arise during a school year.



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J A C K R A B B I T Y A B D H A R E
X O N B T R A O B Y C U A G O B Q E
A W E A S E L B A T D D O C Y A F T
E G I D M E P C T X U D R R Z L O A
R H W G Z D B A B O E A A W O L F N
I D R E T T O T A I G C E M E M O A
D O A R U R Z P R U C R B C U A X M
N L C O A T I I O E H N O S I B U C
U P C Q V W A C P S C S K U N K R O
R H O L E R R I U Q S R F K N E L L
A I Q B P Y J N T E A U R U H A V L
U N N I A O E A A T X T M P F U T I
G E A G D H R L V O Q P O F A E A D
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J A B O K A N T O H L B S R S P R M
M H Q R A N I K C I R I E X U N T R
O W E N R C M L G K S F N P B T U A
N R O G H N O R P Z M E G A X C N G
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DO YOU KNOW YOUR MAMMALS?

We are presently living in the Age of Mammals which began more than 60 million years ago. During this time, mammals have spread over the entire earth and can be found in almost every kind of climate and habitat. They are in the air (bats), in the waters (whales), in the jungles (monkeys), on the deserts (kangaroo rats) and on the frozen icecaps (polar bears). Man, the most advanced mammal of all, has even ventured to the moon and back.

Some of the wild mammals of North America are listed below and, to make it interesting, we have hidden them in a seek-and-find puzzle. See how many of the 48 names you can locate.

1. Aoudad
2. Armadillo
3. Badger
4. Bat
5. Bear
6. Bighorn
7. Bison
8. Bobcat
9. Buffalo
10. Chipmunk
11. Coati
12. Cougar
13. Deer
14. Dolphin
15. Elk
16. Ferret
17. Fox
18. Gopher
19. Hare
20. Jackrabbit
21. Jaguar
22. Jaguarundi
23. Javelina
24. Manatee
25. Margay
26. Mink
27. Mole
28. Mouse
29. Muskrat
30. Nutria
31. Ocelot
32. Opossum
33. Otter
35. Porpoise
36. Prairie Dog
37. Pronghorn
38. Rabbit
39. Raccoon
40. Rat
41. Ringtail
42. Seal
43. Shrew
44. Skunk
45. Squirrel
46. Weasel
47. Whale
48. Wolf

J	A	C	K	R	A	B	B	I	T	Y	A	B	D	H	A	R	E
X	O	N	B	T	R	A	O	B	Y	C	U	A	G	O	B	Q	E
A	W	E	A	S	E	L	B	A	T	D	D	O	C	Y	A	E	T
E	G	I	D	M	E	P	C	T	X	U	D	R	R	Z	L	O	A
R	H	W	G	Z	D	B	A	B	O	E	A	A	W	O	L	F	N
I	D	R	E	T	T	O	T	A	I	G	C	E	M	E	M	O	A
D	O	A	R	U	R	Z	P	R	U	C	R	B	C	U	A	X	M
N	L	C	O	A	T	I	I	O	E	H	N	O	S	I	B	U	C
U	P	C	Q	V	W	A	C	P	S	C	S	K	U	N	K	R	O
R	H	O	L	E	R	R	I	U	Q	S	R	F	K	N	E	L	L
A	I	O	B	P	Y	J	N	T	E	A	U	R	U	H	A	V	L
U	N	N	I	A	O	E	A	A	T	X	T	M	P	F	U	T	I
G	E	A	G	D	H	R	L	V	O	Q	P	O	F	A	E	A	D
A	L	R	H	T	Y	K	P	K	E	I	G	U	B	R	D	I	A
J	A	B	O	K	A	N	T	O	H	L	B	S	R	S	P	R	M
M	H	Q	R	A	N	I	K	C	I	R	I	E	X	U	N	T	R
O	W	E	N	R	C	M	L	G	K	S	F	N	P	B	T	X	A
N	R	O	G	H	N	O	R	P	Z	M	E	G	A	X	C	N	G

Wildlife, Man and the Environment

Title: CONSTRUCTING A NATURE TRAIL

Concept: Interpreting the total environment is necessary in order to comprehend environmental problems.

Objectives: Upon completing this activity, the student will be able to name at least three of the following:

Non-living parts of the environment.

Living parts of the environment.

Human influences on the environment.

Living/non-living interactions in the environment.

Living/living interactions in the environment.

Problems in the environment and possible solutions to those problems.

Materials: Coat hangers, 3x5 cards, tape or string.

Activity: (1-6 hrs.) This exercise can intertwine the whole collection of exercises and be applied to any grade level.

The final part of the exercise develops verbal and written communicative skills.

Begin by selecting an area for your nature trail. Ideally this might be a field or woodlot, but a school lawn will work, especially if you can arrange for the maintenance staff to leave a swath of unmowed grass that will develop into a strip of wild flowers (which may be mistaken for weeds).

After selecting an area for your nature trail, assign each student, or a small group of students, to a possible station along the trail. This may be a wildflower, an animal track, a tree, a burrow, a rock formation, a soil type, a piece of litter or anything in the environment.

By untangling a coat hanger the student has a trail marker to which he attaches a 3 x 5 card with a piece of tape or string. This marker names his station. His job is to find out as much as he can about that station by using the library.

When the research is completed the entire class will walk the trail and each student will explain his station to the remainder of the group.

Another follow-up can include a written explanation of the station which can be incorporated into a nature trail newspaper for the class or maybe even the school. Mimeograph machines along with class art work can produce an attractive project.

Carrying it another step, the whole activity could be the focal point of a PTA, PTO or Back to School Night for parents and the community.

By using imagination all kinds of trails can be developed to show parts of the environment and the affect of humans on the environment.

Title:

URBAN WILDLIFE ACTIVITY

Concept: Wildlife can be found and observed in an urban environment.

Objectives: Upon completing this activity, the students will be able to:

Name four different animals that live in an urban environment, and list the five basic survival needs for these animals.

Write the names of three urban animals and list where the animals obtain their air, food, water and shelter.

Draw a picture or make a collage showing three different animals found in the urban community.

Activity: (2 hrs.) While in the classroom, have the children name the kinds of animals that live near their homes. What kind of homes do the animals live in? Did the animals build the houses, or did they use something man constructed.

On a blackboard, list the animals talked about, and the type of home used by each one.

Discuss the five things each animal needs to survive--1. food, 2. air, 3. shelter, 4. living space, and 5. water. Do any of the animals listed get any of these five needs directly from man? Do different animals need the same type of food, shelter...?

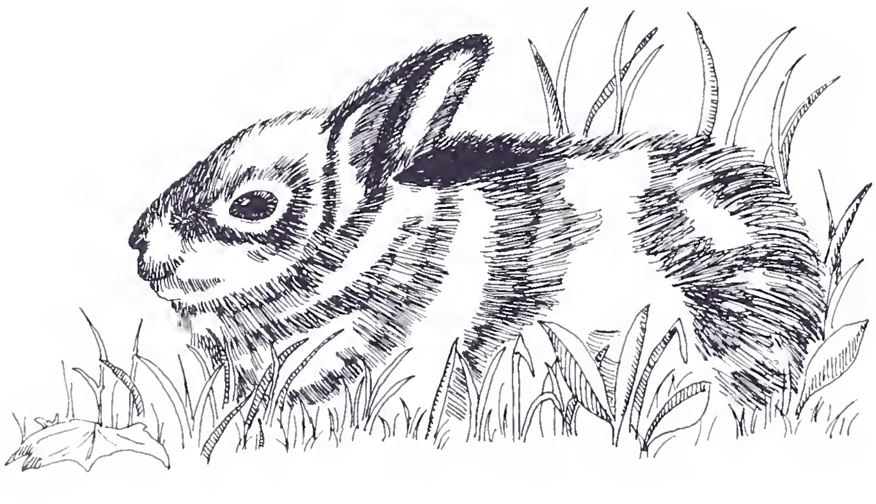
Pick an area outdoors where you can take the children on a field trip. Study the area beforehand to be sure there is adequate wildlife and that there are signs of wildlife to be found rather easily--nests, burrows, tracks, droppings...

Have the children look for any of the animals or the homes, they talked about in class. When something is discovered, gather the children together and ask them where and how the animal gets his five basic needs--food, water, shelter, living space and air. Is it easy or difficult for this particular animal to find these things? Why? Could we (man) have something to do with the ability of the animal to survive? Why does this animal live close to man, instead of in the woods?

Assignment for the students--Ask each child to find an animal or animal home near his own home. Have them observe what they found for one week.

Then group the students according to the kind of animal or animal home they found. For instance, you may have groups of rabbits, pigeons, squirrels, etc. Ask each animal group why they live where they do--reminding the children to think about the five basic needs. For example-- "Pigeons, why do you live in the Church steeple?"

Finally, ask the children to decide which animal is most commonly found in their area. (They should do this by discovering which animal group has the greatest number of children in it.) Then have the children explain why they feel this animal is most common.



Title:

FARM VS. FOREST, A LAND USE SIMULATION GAME

Concepts:

Farm and forest land are valuable natural resources that affect the historical and cultural values of our society.

Unspoiled natural aveas represent a part of our heritage that is necessary in maintaining the quality of life on earth.

Objectives:

Upon completing this activity, the student will be able to:

Describe the difference between objective decisions and moral issues, realizing there is no singular correct answer.

Activity: (2-3 hrs.)

This activity will enable children to explore the feelings of people directly involved in land use decisions, and recognize the difficulty of being objective about those decisions when special and personal interests are involved.

The state highway department is constructing a new limited access highway through one section of the county. Engineers have proposed two alternative routes. One route would run through gently rolling farmland with a solid geological foundation for highway construction. Land acquisition costs would be high but construction expenses relatively low. The other route would travel through hilly forestland where land costs would be low, but construction expenses high. Total cost of each alternative route would be equal.

Description of farmland: The farmland is the best in the county. It is naturally fertile, well drained soil with a limestone foundation, all tillable with the exception of some meadowland in the stream valleys. Few conservation practices are required and a high intensity rotation produces high yields of top quality grain and hay crops. There are well equipped dairy farms here, the bulk of the milk in the county being produced in this area. In addition to its rich and productive soil, this area includes early farm buildings of architectural and cultural significance. Directly in the path of the highway is the stone cabin of the first settler and founder of the county, recently restored by the local historical society, as well as its adjacent burial ground. The historical society plans to open this site to the public as a museum dedicated to the memory of the pioneers of the area.

Description of forestland: The forestland contains a diversity of terrain, most of it hilly and steeply sloping, a condition that has kept it isolated from the works of man and has given a unique "wildness" in character. One section of the forest, which the highway would directly intersect holds the closest stand of chestnut oaks, stately trees with spreading crowns, inspiring a feeling of reverance for those persons who take the time to penetrate its borders. Nearer the edge of the forest, in a quiet glen and also in the pathway of the proposed highway, is the county's oldest living tree. "The Ancient Oak", a rare yellow oak with a circumference of 24 feet 6 inches, has been maintained in good health by the Ancient Oak Society, a local conservation group. The Society has recently developed a park here, a place for people to escape everyday cares and find refreshment and renewal in this wooded area. The remaining woodland consists of mature deciduous forests of chestnut oak, scarlet oak, white oak and black oak, with some red maple and one large stand of hemlock. Springs originate in the forest that supply pure water to several small villages in the vicinity. These springs feed a picturesque mountain stream which is an outstanding trout stream. Of course an area such as this provides habitat for a wealth of wild animals and wildflowers.

Procedures: Because the cost factors balance for each alternative route, the state highway department will make its decision based on the ecological and cultural factors involved. A hearing has been set during which both sides, those in favor of preserving the farmland and those who want to preserve the forestland, will be able to present their arguments. A board of three persons will hear the arguments and make the decision of which alternative route to use.

Roles: Three directors of the State Highway Department. Function: (1) Will compile a list of questions to ask at the hearing to aid them in making their judgement. (2) Will conduct the hearing. (3) Will reach a decision as to which alternative route will be used for the highway construction.

All others will be divided into two groups, one to preserve the farmland, the other to preserve the forest. Members are to organize their own groups and choose the roles they wish to play.

Suggested Roles: Groups to preserve farmland--farm owners, local dairymen, consumers who use farm products, soil conservationists, Historical Society members and descendants of first settlers. Group to preserve forestland owners, wildlife conservationists, Ancient Oak Society members, sportsmen, consumers who use water from forest and water authority of village, company with lumbering interest in part of forest and Scout Troop.

p.a. rotheimer

Title:

MOVE OVER PLEASE-- A STUDY OF OVERCROWDING

Concept:

Any component of an environment--food, air, water, space--may become a limiting factor to the growth of an organism.

Objectives:

Upon completing this activity, the student will be able to:

List five factors which limit the growth of organisms.

Define overcrowding.

Construct a bar graph showing how many seeds germinated under each environmental factor.

Materials:

Small pots, seeds (radish, corn, flower varieties).

Activity: (1/2-1 hr.)

This exercise shows how some factor in the environment may limit or affect the growth of an organism. It also gives students a sense of husbandry by growing plants.

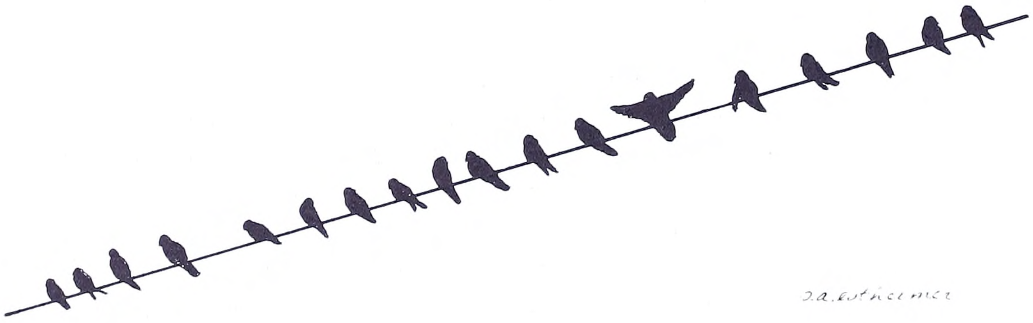
Divide the class into small groups (3-5) giving each group five small pots labeled A, B, C, D and E. Using geometric ratios plant two seeds in A, four in B, eight in C, 16 in D and 32 in E.

Maintain all factors (light, temperature, moisture) as constant as possible and make observations of growth over a period of 2-4 weeks.

Summarize the conclusion that can be made about crowding and growth in plants. How does this affect the gardner or farmer. Does crowding affect animal growth? How is it similar? How would it be different?

What is the difference between finite and infinite.

Follow-up: If feasible an excellent activity is a class garden. So many ecological concepts and problems can be incorporated into this first hand experience. Drought, rodent damage, competition (weeds), insect damage... are all involved and some genuine learning can take place. By using herbs and sone "wild" transplants, and by documentary and reporting the results the project can evolve into a real multi-disciplinary activity.



D.a. Rothermer

Title: HOW BIG IS A BIG NUMBER?

Concept: It would take one full week (24 hour day) to count to 1,000,000.

Objectives: Upon completing this activity, the student will be able to:

Describe, in a logical context, the size of the figure 1,000,000.

Activity: (1/4 hrs.) Students are confronted with large numbers...millions of insects, millions of acres, millions of dollars. In order to comprehend this number try this approach.

Talk about big numbers and list some examples on the board. Have the students guess how long it would take to count to 1,000,000 and record some of these guesses on the board.

Select one student and have her count to 100 while you time her. Have her count clearly and at a reasonable pace. Ask the remainder of the students to do the same quietly. It should take about one minute.

On that basis that it would take a minute to count to 100, and since there are 10,000, 100's in a 1,000,000, it would take 10,000 minutes or 6.9 days to count to 1,000,000.

That involves 24 hours of counting and assumes it would be as easy to count from 701,001 to 701,100 as it would to count from one to 100.

Most kids, and adults find this surprising. It enables them to have a more realistic concept of a large number. You can continue by extending the number to 1,000,000,000.

Title: **LET'S GO CAMPING**

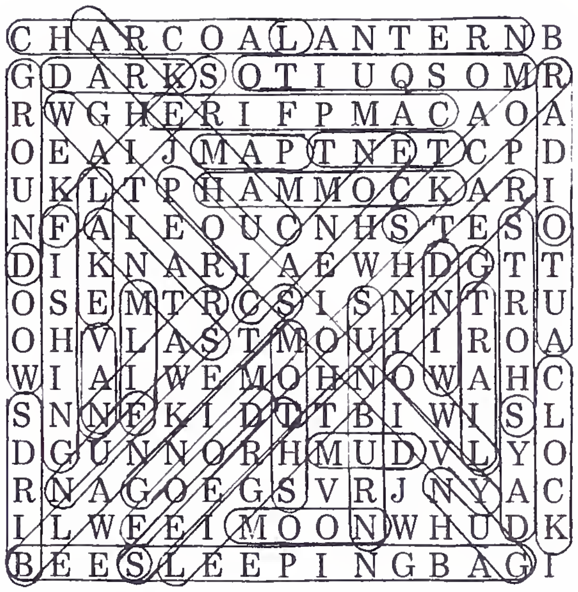
Concepts: Camping is a fun kind of recreation relating to our environment.

Objectives: Upon completing this activity, the student will be able to:

List the living and non-living things discussed in the word game.

Activity: (1/2 hr.) This environmental word game is designed as a problem solving exercise which reenforces words pertaining to the outdoors.

These word games make practical "additional" or "special" activities for different situations that normally arise during a school year.



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C H A R C O A L A N T E R N B
G D A R K S O T I U Q S O M R
R W G H E R I F P M A C A O A
O E A I J M A P T N E T C P D
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O H V L A S T M O U L I R O A
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B E E S L E E P I N G B A G I
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LET'S GO CAMPING

What kind of vacation do you prefer? Do you like a hotel with swimming pools and huge dinners served to you? Or do you prefer to "rough it" by hiking, fishing and cooking your catch yourself?

1. Ants
2. Auto
3. Bees
4. Birds
5. Blankets
6. Camera
7. Campfire
8. Canoe
9. Charcoal
10. Clock
11. Dark
12. Days
13. Film
14. Fishing
15. Flies
16. Food
17. Fun
18. Ground
19. Gun
20. Hammock
21. Lake
22. Lantern
23. Lightning
24. Map
25. Matches
26. Mosquito
27. Moon
28. Moths
29. Mud
30. Owl
31. Paths
32. Poison Ivy
33. Radio
34. Rain
35. Rocks
36. Shorts
37. Sleeping Bag
38. Sunburn
39. Swimming
40. Tent
41. Thunder
42. Trail
43. Trailer
44. Trees
45. Van
46. Water
47. Wind
48. Wood

C	H	A	R	C	O	A	L	A	N	T	E	R	N	B
G	D	A	R	K	S	O	T	I	U	Q	S	O	M	R
R	W	G	H	E	R	I	F	P	M	A	C	A	O	A
O	E	A	I	J	M	A	P	T	N	E	T	C	P	D
U	K	L	T	P	H	A	M	M	O	C	K	A	R	I
N	F	A	I	E	O	U	C	N	H	S	T	E	S	O
D	I	K	N	A	R	I	A	E	W	H	D	G	T	T
O	S	E	M	T	R	C	S	I	S	N	N	T	R	U
O	H	V	L	A	S	T	M	O	U	I	I	R	O	A
W	I	A	I	W	E	M	O	H	N	O	W	A	H	C
S	N	N	F	K	I	D	T	T	B	I	W	I	S	L
D	G	U	N	N	O	R	H	M	U	D	V	L	Y	O
R	N	A	G	O	E	G	S	V	R	J	N	Y	A	C
I	L	W	F	E	I	M	O	O	N	W	H	U	D	K
B	E	E	S	L	E	E	P	I	N	G	B	A	G	I

FOLLOW-UP ACTIVITIES

There are so many things to do with kids! Here are some brief descriptions of other activities we've tabbed follow-ups. We needed some logical arrangement, and for your convenience, we've grouped them according to subject areas. Don't let that stunt your creativity. Adapt, alter and change them as you see fit. Though not as detailed as the previous activities they are handy not only as supplemental exercises, but can be incorporated by themselves.

ART

(1) Bird tree cutouts: select a large branch and bring it into the classroom. Using poster board or construction paper, cut out different birds of your neighborhood and hang them on the tree. Nests may also be cut out for the tree. Have the children learn all the birds on their bird tree.

(2) Food chain mobiles: create mobils by cutting out different kinds of wildlife. Each class member can take a different species and either create original artwork or cut pictures from magazines and post them on cardboard. Include pieces of plant material, bones, feathers or other animal parts. Construct the mobile so that it shows a food chain with each connecting part being related in some way. The lowest parts of the mobile should represent producers or green plants and the upper levels should represent the carnivores. If enough food chains can be worked into one large mobile it should resemble a food web.

(3) Patterns in nature: different insects and spiders and other animals have interesting color patterns or designs on their bodies. They also create interesting patterns in their webs, eggs, nests or other parts of their homes. Make sketches of these designs and use the patterns to design something to wear or something for decorating your home.

(4) How hawks soar: because of their large wing span, many hawks do a lot of soaring. Thermal uplifts rising from crests of hills or along ridges provide them with the lift they need to stay aloft. Cut a heavy sheet of construction paper in half. Place these these halves together, one on top of the other and fold them in half. Using silhouettes from a bird guide, draw half of a hawk or an eagle silhouette on one side of the folded paper. The center line of the bird should be down the fold in the paper. By cutting out the silhouette and unfolding the paper you should have two complete hawks or eagles. Find the

balancing point of the bird along the center line and then put both birds together and punch a hole through the paper at the balance point. Hang the birds from short pieces of thread passed through these holes.

By using a piece of wire (coat hanger), locate the balance point of your hawk and hang it from the string at this point. By hanging the hawks from the end of the wire a simple mobile is constructed.

Using a candle as a heat source, allow one bird to hang above the candle just high enough that the paper will not catch fire. This updraft will make the bird rise and move. Such rising air currents are what hawks and eagles and vultures utilize in their soaring flights.

(5) Bulletin board displays: prepare displays for National Wildlife Week or other wildlife events. Make the display show the value of wildlife in your community including aesthetic values. Patterns, colors, line and form can all be illustrated through members of the wildlife community.

(6) Leaf print (carbon method): materials--construction paper (pastel colors) ditto paper, shortening, candle, scissors. Begin by rubbing shortening over the ditto paper making sure the paper is evenly coated. Hold ditto paper over the lighted candle with the greased side down close to the flame. Be careful not to hold the paper too close to the flame, just close enough to get a good coating of carbon. Once the paper is "carboned," place a leaf (veined side down) on the carboned side and apply a piece of scrap paper on top. Rub thoroughly to get a good coating of carbon on the leaf. Remove leaf from paper and apply to a piece of construction paper. Again, put a piece of scrap paper over the leaf and rub thoroughly. Remove paper and leaf. You should have a clear, clean print including veins and stem of the leaf. This print should not rub off. These prints make excellent note papers or greeting cards.

(7) Leaf prints (print method): materials--paint brush (#6 or smaller), poster paint in all colors, colored construction paper or newsprint, tweezers and scissors. Have each class member select a number of leaves of interesting sizes and shapes. Make sure leaves are free of dirt and moisture by wiping with paper towel. Paper should be cut to size and shape needed. (This

is a good time to think of how the finished print could be used, for example, letterheads, bookmarks, posters. Heavier paper or card stock could be used for greeting cards or flash cards for leaf identification.) Apply a thin coating of paint on leaf and put leaf directly (paint side down) on paper. Lay another piece of paper over the leaf carefully and press gently. Remove the top sheet of paper and remove the leaf with tweezers. Allow the print to dry. Variations of design can be accomplished simply by using several leaves of different sizes and shapes and arranging the leaves in different positions. For added variations, grasses or twigs can also be used with the leaves.

(8) Bark rubbings: materials--large sheets of newsprint or any sturdy paper, large flat crayons, masking tape. This is an outdoor activity and should not be attempted after a rain. Wrap a large sheet of paper around the tree and tape securely. With a large flat crayon begin rubbing from top to bottom. Rub only one way so paper does not tear. After entire paper has been covered with the rubbing, remove from tree. The unusual patterns created by the rubbings are excellent for studying patterns in nature.

ENGLISH

(1) Write a letter to a friend telling him about an animal you recently saw. Describe what the animal was doing and where it was that you observed him--pond, marsh, field, woodlot.

(2) Wildlife Skits: write plays or skits about animals and perform them through role playing. Also use pantomime to act out these skits.

(3) Short story: have students write a short story about the animal they feel is the most valuable to Pennsylvania. Have them explain why they chose this animal and list the reasons for their choice.

(4) Eagle-turkey debate: During the early days of our country it was debated which bird should represent out national anthem. Ben Franklin proposed the wild turkey, but as we know the bald eagle won out as our national bird. Have your students debate this question after researching the background on both species.

(5) Knothole prose: By either going outside or looking out the window, make a "knothole" by

placing your forefinger and thumb together. Hold the peephole about six inches from your eye and describe what you see in the most detail possible. Then, returning to their seats, have the students write a short composition about what it was they saw.

(6) Wildlife poems: assign a particular animal to each student have them write a poem about this critter. Include aesthetics, curosity, habits and other characteristics.

(7) Alphabet hunt: the game involves going through the alphabet, letter by letter, to name the parts of the environment. Begin by listing 26 columns (A-Z) on the chalk board or by having each child list the same on his paper. Going around the class have each student go to the board and name a part of the environment beginning with the letter of the column to which she is assigned.

FIELD STUDIES -/- SCIENCE

(1) Field box or touch station: using a tin can or sock place inside items kids can guess by reaching into the sock. Acorns, stones, twigs, pine cones, maple seeds, thistle down, animal fur, hickory nuts, peach pits, leaves...your subjects are limited only by your imagination.

(2) Matching sounds: use twelve cans (1 lb. coffee cans, nut cans) and label six of them one through six and the remaining six a through f. Using six different stuffers (pine cones, seeds...)place one kind of material in one of the cans marked one through six and the same material in one of the cans a through f. Do the same for the remaining ten cans. By shaking the cans the student is suppose to match the sounds of the one through six group which the sound of the a through f group.

(3) Wildlife plantings: plant seeds for different wildlife "crops". Use sunflower seeds, barley, millet, corn...and allow the plantings to flower and seed. Watch and observe to see what pollinates the plants. Use the seeds that result for wildlife feeders or leave them intact on the plants and observe wildlife using the area. Odd corners of the school grounds, adjacent lots, school courtyards or other areas make ideal locations for the plantings.

(4) Building bird nests: have the children construct a birds nest by gathering only those materials that a bird might use in constructing its nest.

Nothing can be made in the classroom. If building swallow nests only one tiny dab of mud may be used at a time and it must be found. The idea is to show how much work goes into building a nest which hopefully will give the student more respect for nest in the wild and discourage the chance of them being destroyed.

(5) Food web story: construct a story based on a given wildlife community...like a marsh, pond, woodlot, field or similar area. Each part of the living community will be represented by a student. Teacher will begin the story by making a statement like, "Once upon a time there was a bright shining sun in the sky." Use one student as the sun and start the string with him. He will then complete the next statement of the story and repeat it out loud. He might say, "the sun shone on a great oak tree." At this point he passes the string to the giant oak and this student can then construct the next statement of the story. The oak stood on fertile soil, which was watered by nearby spring, which also supplied water for squirrels, jays and other birds. Continue the story by tying one organism or parts of its environment to the other parts of the wildlife community. Make the story as complex as possible and don't forget to introduce man somewhere along the way. Other students should be watching for erroneous statements that might be made like a squirrel eating soil or maybe a squirrel eating a robin or some faulty remark. Repeat the story for a different setting which will familiarize children with the different kinds of wildlife communities we have.

(6) Toothpick game: using colored toothpicks, separate them into the different colors using equal numbers of each color. Mark off an area five feet square on a lawn. Scatter the different colored toothpicks onto the ground in a random fashion. Then have the students look for toothpicks while pretending to be predators. They cannot brush their hand along the ground and it might be good to use a pair of forceps representing the talons of a hawk or owl. Record the number of each color found and note which colors are the most difficult to see. Discuss this exercise in relation to protective coloration in wildlife.

(7) Pennsylvania wildlife: make flash cards by cutting out pictures of different kinds of wildlife and mounting them on cardboard. By flashing the cards in front of the class award the card to the person correctly identifying the animal. The winner is the person with the most cards at the end of the game.

(8) Christmas trees for birds: gather large pine cones and mount them individually on a base. Arrange with a local butcher shop for a quantity of suet. Melt the suet and pour it over the pine cones making sure to fill the cracks completely. Set these on window sils and observe the birds that visit. By adding dabs of peanut butter the "trees" become even more attractive.

(9) Animal defenses: Discuss the different ways animals defend themselves from danger. Collect examples of teeth, claws, horns, antlers, spines, and the like. Also consider flight speed, stinging devices, bluffing techniques, feigning death, mimicry, scent...try to find pictures of all animals used in the discussion and make a bulletin board display.

(10) Owl food habits: by finding a place where owls might roost (conifer plantations) you may be able to find owl pellets. These pellets consist of hair and bones of whatever the owl has eaten. By dissecting these pellets parts of skulls and other bones can be found. These skulls will consist mostly of mice, shrews and voles. An interesting display can be made by mounting these bones and other animal parts and trying to identify them.

(11) Wildlife and the seasons: discuss the affects of the seasons upon the wildlife of your area. Note how it affects pelage, antler growth, fat tissue, reproduction, raising of young, food storage, migration, hibernation or other seasonal changes. Note how cold-blooded animals are affected differently than warm-blooded animals. Compare brook trout with red foxes.

(12) Oily ducks: rub a light coat of oil on one of two sheets of paper. Sprinkle water on both pieces and observe the difference in the way water affects the two sheets. Note how a duck or other wild bird will preen its feathers during a rain. Explain the value of the oil to the birds and where they get the oil (preen gland). Explain how too much oil on the feathers of a bird can be bad like when a bird lands on a body of water polluted with oil.

(13) Natures mystery quiz: each day (or week) place a different natural mystery item on the bulletin board or on a reserved shelf. Students look at the item and try to determine what it is they see. Then by writing their guess on a slip of paper they place it into a box. Students collect points for correct answers which are kept over a period of time. At the end of the month or semester winners are determined and maybe a small prize given. Objects to consider are

feather types, tooth types, pieces of fur, animal droppings, owl pellets, a piece of wood with beaver tooth marks on it, different kinds of leaves, seeds, twigs or anything found around the school. Pictures could be used of animals or animal tracks and the like. There should be enough references in the class library so students can "dig out" the answer.

(14) Colors and birds: by soaking cracked corn or other bird seed with food coloring you can determine if birds have a preference for certain colored foods. Place equal amounts of seed on diferent trays and note how quickly certain colors are consumed. Include the natural color of the grain in your selection. Is there any one color they do not eat?

(15) Indoor bird walk: after some initial bird study pretend to take a bird walk indoors. Identify several areas of the classroom as different types of habitats like forest, field, marsh, orchard and so on. Choose about ten children in the class and allow them to decide on the name of a common bird in your community. These "birds" scatter to their respective habitats where they would normally occur. Lead the group on the bird walk going through the habitats. The leader stops and lifts his binoculars (cups his hands in front of his eyes for pretend binoculars) and looks at a "bird". The rest of the bird walkers put their "glasses" on the same bird and when he sees everyone looking at him, he begins to give clues as to the kind of bird he represents. For instance he might say, "I am the smallest bird you will see." (hummingbird) Or, he might say that I am as big as a robin but have red and yellow on my wings and the rest of me is black. I nest in cattails. (red-winged black bird) Each "bird" should have a list of clues to read for the walkers. The same game can be played with mammals, insects or a mixture of wildlife types.

(16) Wildlife highway mortality: keep a record of all the different kinds of wildlife found dead along a given stretch of highway. Note if the mortality various with the season, or with the weather or with any other variables. Keep these records over a period of time and draw conclusions from your abservations.

(17) Where did it come from?: Compile a list of foods, products or articles commonly used by

kids. Then trace each item back to its origin. Example:

- -- egg → supermarket → farmer → chicken → grain → soil → sun.

- -- wallet → store → factory → tannery → slaughterhouse → steer → grain and grass → sun.

Note how many items can be traced back to the origin. In addition to soil, what are other important non-living componets of the environment (air, water). Why?

(18) Predator/prey game: Assign some of the children in your class to be prey animals and some to be predators. Blindfold the prey and move them some distance from the predators putting them into their natural "habitat." It's the task of the prey animals to approach and touch the prey before they can be heard. If the "prey" hear an approaching predator they point into the direction of the prey. If they are correct the prey then becomes the predator and vice-versa. If you were an animal how would you protect yourself from predators?

(19) Tiger tail: Using a piece of heavy rope approximately 6 to 10 feet long, have the students apply double stick tape to the tail. Have them drag that tail through a field near the school and note all of the things that become attached. This is especially good to show different kinds of seed dispersel.

(20) Seed walk: Have the students wear jeans or slacks on this day and ask them to roll up their cuffs. By walking in a nearby field they will collect different kinds of seeds and other debris in the cuffs. Returning to school, have them stand over a newspaper and empty their cuffs. Gather the debris they collected and plant it in a seed pot. Note all the things that will grow from this seed hunt.

MATHEMATICS:

(1) Forest soils are alive with small animals such as mites and earthworms. Studies indicate that as many as 9,939 small critters may be found in one square foot of forest litter (2 inches in depth). How many per square inch? Yard? Acre? Convert these measurements to metric measure.

(2) One pair of adult deer on good range will produce two fawns per year. Fawns are born

50-50 male-female. Fawns mature at two years old. Starting with one buck and one doe, how many deer would there be in a herd at the end of five years? Ten? If hunters harvest 10 percent of the mature bucks each year, how many would there be? How many bucks? How many does? How many fawns? Make a graph or a chart of these figures.

(3) How long does this change take? Using long lengths of adding machine tape, make graphs of various biological actions and changes. Use a scale of one inch equal one month. Measure different gestation periods, doubling of populations through geogmetric progressions, growth of trees, childrens growth and life spans, and similar events.

(4) Four bobcats and 3,000 deer mice live in and around the forest clearing. Each bobcat eats ten mice per day. How does the mouse population stay the same? Six kittens are born. How does this affect the mouse population? Will this affect the number of seeds eaten by the mice? Will the number of seeds eaten affect the forest clearing? Does a bobcat affect grass?

(5) Work out populations for quail and deer: start with one pair and solve the populations for one, three, five and ten year periods. Plug in the following factors of longevity, reproductive ability, predation, disease, accidents and the like. Compare these figures with the actual population levels you would expect and explain the differences.

QUAIL

Average lifespan two years
Matures in first year
Average annual production twelve young
Average annual loss 70 percent of flock

DEER

Average lifespan seven years
Matures in two years
Average production two per year
Fawns born 50-50 male and female
Annual loss 50 percent of herd

Average annual loss is indicated here attempts to show accidents, predation, habitat loss, hunting, overcrowding...it is not an exact figure but an estimate.

(6) In a food chain involving the sun, clover, rabbits and foxes, the following figures can be used:

a. the sun gives each clover plant 50,000 energy units per month.
b. clover can only store 1/5th or 20% of this energy.
c. a rabbit needs 5,000 energy units per month.
d. foxes need 10,000 energy units each month.
e. rabbits have about 10 percent food chain efficiency and a fox has about 20 percent food chain efficiency.
f. each clover plant would store 1/50th of 50,000 units of energy or one hundred units each month. For each clover plant that the rabbit eats, it stores only 10 percent of the plants energy, or 10 units. Because the rabbit needs 5,000 units each month, it must eat 500 clover plants.
g. the fox can store only 20 percent of the rabbit energy that it eats, so for each rabbit a fox kills and eats it stores only 1,000 units of that energy. Because the fox needs 10,000 units each month, he must eat 10 rabbits each month. Ten rabbits a month is equilavent to ten times 500 clover plants. Each fox then consumes 5,000 clover plants via ten rabbits.

Work out problems involving the desired population of 5, 31, 49, 93 foxes. How many rabbits will be needed for each population? How many clover plants would it take for each rabbit? Each fox? If 10,000 clover plants grow on one acre, how many acres are needed to supply these foxes?

MUSIC:

(1) Have the children listen to bird songs in real life or on records. Notice the differences in the songs and then play them on the piano. Try to write the songs as music. Why does a bird sing? Because he is happy? Or is it to warn other birds of his kind that "this is my territory"? Do the same with other animal sounds.

(2) Write a poem about a wild animal and set it to music. Try writing words to existing music. Consider things like chipmunks, robins, deer, or any favorite wild animal. Try to find musical passages that we feel best describe our wild animal friends.

PHYSICAL EDUCATION:

(1) Curiosity game: play this game outside in a natural environment. Assign some item to be found like a pine cone or a maple leaf or a mushroom. Children scatter and begin searching and when the item is found by a student he cries out and others assemble around to see what he has found. Items should not be removed from the spot. Continue by asigning another item and continue with at least ten different things. This exercise sharpens the child's ability to observe. Each time an item is discovered explain why it is found at that particular place.

MORE ACTIVITIES

The following exercises were developed through the Bureau of State Parks by the Nolde Forest Environmental Education Center staff. They are for use in the field or classroom, and directly involve the student with the discovery approach in learning about his environment. They are available from the Nolde Environmental Education Center, R. D. #1, Box 392, Reading, Pa. 19607.

ACTIVITY:

#1 Microscopic Aquatic Animals (Grade Level 5-7) Designed for classroom use, this learning experience deals with collection, culturing and study of microscipic freshwater organisms.

#2 Pond Food Chain (Grade Level 4-6) Students look for signs of animal life in on and around a pond. Discussion includes identification of organisms and where they fit into a food chain. Also adaptable for use with a stream.

#3 The Drain Board of the World "The Water Shed"-(Grade Level 5-6) Useful as a unit, watersheds are discussed along with their importance to man. Suggestions include a study of needs and source of water for a local Community.

#4 Water - Our Most Precious Resource (Grade Level 4-6) Water is discussed in terms of its physical characteristics (temperature, color, odor) and aquatic organisms and the physical characteristics effecting these organisms.

#5 Stream Study (Grade Level 5-6) Physical characteristics and the topography in the area of the streams are studied.

#6 The Stream As a Carrier of Sediment (Grade Level 5-6) This activity should be carried out over several weeks in the classroom. Water collected from various streams is observed for amounts and kinds of sediments and of where the sediments came from.

#7 Water Quality (Grade Level 5-6) Visits are made to community water source and sewage treatment plants; in conjunction with discussions on what determines the quality of water, especially for human use, man's need for water, and the disposal of "used" water.

#8 Water Pollution (Grade Level 507) Classroom discussion includes types and sources of water pollution in conjunction with visits to local water treatment plant, sewage treatment plant, and bodies of water to check for pollution.

#9 An Animal That Lives in Freshwater: A Freshwater Serpent (Grade Level 5-6) Designed for classroom use over several weeks, this learning experience deals with collection, culture and study of the hydra.

# 10 An Animal That Lives in Freshwater: The Worm with Ears and Eyes (Grade Level (5-6) Designed for classroom use over several weeks, this learning experience deals with collection, culture and study of planaria.

#101 Plant Identification (Grade Level 5-6) Non-flowering plants (ferns, mosses, algae, lichens and fungi) are compared to flowering plants and each other.

#102 Woods and Field - The Effects of Light (Grade Level 5-6) Plant growth is related to the amount of sunlight in an area. Comparison is made of the numbers and types of plants in wood and field areas.

#103 Seeds (Grade Level 2-4) Seed types are compared with emphasis on adaptations for dispersal.

#104 Flower Function (Grade Level 5-6) Flowers are examined in various stages of development. Odors, and flower parts are compared as well as insects and their importance to flowers.

#105 Fungus on a Log (Grade Level K-2) Fallen trees and plants growing on them are compared with emphasis on fuel, color, smell.

#106 Numbers in Nature (Grade Level 5-6) Numerical patterns and geometric shapes and patterns are observed in natural items. Some plants that are named from these patterns are discussed.

#107 Spore-Bearing Plants (Grade Level 5-6) Characteristics of monocot and dicot plants are discussed and plants examined to determine if they are moncots or dicots.

#151 Comparison of Coniferous and Deciduous Woods (Grade Level 2-6) Use of the senses is emphasized in comparing a coniferous and deciduous area.

#152 Tree Buds (Grade Level 2-6) Buds of various trees are compared as to shape, size, leaf arrangement in the bud, number of leaves in one bud, color of new leaves, time of buds opening and flower vs. leaf buds.

#153 Tree Stumps and Annual Rings (Grade Level 5-6) Annual rings on the tree stumps and logs are used to determine age of the tree, compare growth at different stages in its life and growth patterns of various types of trees.

#201 Animal Tracks (Grade Level 2-6) Signs of animal presence such as sounds, tracks, food, homes and droppings are looked for and discussed.

#202 Animals Living in the Field and Woods (Grade Level 5-6) Small groups (2-3) of students are assigned to investigate a 50 square foot agea for types and numbers of animals or animal signs and the location where they were found.

#203 The Robin and Fisherman's Delight (Grade Level 5-7) Directions are given for the collection, culturing and study of earthworms. Students are involved in observing structure, movement and food habits of the worms.

#204 Earthworms (Grade Level 5-7) Students are involved in the observation of earthworms either in a natural environment or cultured in the classroom. Valuable for use in conjunction with Activity 203.

#205 Form Follows Function (Grade Level 5-7) Students examine mouth parts of animals found in the field and try to determine from those observations what the animal eats. Ideas are compared and actual food habits researched.

#206 Animals with Portable Homes (Grade Level 5-7) Directions are given for the collection, culturing and observation of snails in the classroom.

#207 Finned Tenants of An Aquarium (Grade Level 5-7) Methods for setting up an aquarium, habits and collecting techniques for some types of fish, and ideas for the study of the inhabitants of the aquarium are outlined.

#208 The Regal Migrator (Grade Level 5-7) Methods for the collection, culturing and study of monarch butterflies are outlined.

#261 Birds: Observing Habits and Anatomy (Grade Level 5-6) Birds are observed in their native habitats and comparison of habits and structures are made.

#281 Listening To and Looking At Insects (Grade Level 5-6) Insects are studied by looking for homes, listening to the sounds they produce, watching their movement (fly, hop, crawl), looking at mouth parts and relating them to food; observing color patterns in relation to the area where they live and discussing life cycles.

#282 Insects and Plants (Grade Level 2-6) Insects and their interaction with plants for food and homes are observed and discussed. Also, the students try to determine if the insects are "good" or "bad" and the effect of insecticides on the environment.

#283 A Social Insect (Grade Level 5-7) This classroom oriented learning experience deals with ants. Methods for preparing, collecting and maintaining an ant colony and what to observe once the colony has been established are included.

#284 Spiders and Relatives (Grade Level 5-6) Investigation of spiders includes distinguishing spiders from insects, color, legs, eyes, breathing, size, movement and webs.

#285 The Worm That Isn't A Worm (Grade Level 5-6) Designed for classroom use over several weeks, this learning experience deals with collection, culture and study of mealworms.

#287 Grasshopper Population Count (Grade Level 4-6) A method for determining the population of grasshoppers is outlined. Procedures are given to extend the method to other organisms.

#301 Rocks and Minerals (Grade Level 2-6) Rocks are examined for color, shape, texture, size and weight. Older students also discuss the type of rock (sedimentary, metamorphic and igneous) how the rock may have gotten here, what the area is like and composition of the rock.

#302 Structure of the Earth (Grade Level 5-9) Forces within the earth have resulted in the topographic features we have today. Basic structures that have resulted are discussed and field activity involved observation of these basic structures.

#351 Comparison of Soil Types (Grade Level 4-6) Soils are compared for color, texture, composition, smell, moisture content and organisms. Students also determine how the soil was formed and if they can find this process in action.

#352 Erosion (Grade Level 2-6) Discussion includes signs of erosion; erosion control, water as a factor in erosion and the effect of plants and ground cover in erosion control.

#353 Decomposers (Grade Level 2-6) Logs and stumps in various stages of decomposition are studied as to feel, smell and color. The importance of organisms living on and in the wood, what eventually happens to the log and ages of logs are discussed.

#354 Soil Study (Grade Level 5-6) Students work in small groups to determine color, texture, moisture content, smell, organisms present, temperature, pH, and permeability of the soil. Findings are compared and discussed.

#401 Dictionary and Writing Skills (Grade Level 4-6) This classroom oriented activity deals with the development and use of vocabulary relating to ecology and the environment.

#402 Observing With Senses (Grade Level 1-4) Natural objects are compared through the senses of feel (Weight, texture) sight (Shape, color), and smell.

#403 Nature Hunt (Grade Level K-3) Natural and man-made objects are used for a discussion of similarities and differences and the use of descriptive words such as fuzzy, prickly, squeezy and smooth.

#421 Listening (Grade Level 4-6) Sounds are recorded on tape and paper and are taken back to the classroom to compare sounds of a natural area to those in a city.

#431 Experiences in Sketching (Grade Level 4-6) Natural areas are used for sketching the various patterns in nature.

#432 Experience in Expressing Textures (Grade Level 5-6) Textures are discussed as ups and downs or indents in objects. Texture rubbings are made of materials objects and combined into a collage.

#433 Shapes and Patterns (Grade Level K-4) Geometric shapes such as circles, squares, triangles, and lines are viewed in natural objects.

#434 Communications: Sketching and Writing (Grade Level 3-6) Natural objects are used as the basis for sketches and creative writing. Objects are described and feelings about the object are communicated.

#436 The Shadow Over The Woodland (Grade Level 5-6) Designed originally for a remedial reading group, this activity contains a story and questions to introduce concepts about fall seasonal changes and the interrelatedness of nature.

#451 The Effects of Air Pollution (Grade Level 5-7) This learning experience is suited for classroom use over a period of time. The effects and causes of air pollution are studied through various field exercises.

#452 Noise Pollution (Grade Level 5-6) Sound is discussed in the classroom along with what makes a sound a noise and what makes some noises more annoying than other noises. Sounds are recorded and compared in various areas.

#475 Natural Environment vs. Cultural Environment (Grade Level 5-7) The natural environment and its effect on the growth of communities with regard to economics, sociology, and politics are discussed.

#476 The Changing Environment (Grade Level 4-6) The geography of an area is discussed in terms of its effect on politico-socio-economic development, problems it poses for development, and the changes that have occurred over the years.

#485 Community Profile (Grade Level 4-9) A community is surveyed to determine the type of people living in the area, the needs of these people, the importance of transportation and business to the community and the role of the student in the community. Students use a door to door survey to collect information.

#486 Natural Community Profile (Grade Level 4-9) This learning experience is designed to be used with #485 Community Profile. A natural community is surveyed for diversity of plants and animals, the needs of the plants and animals, the importance of light and trails, and the role of the plants and animals in the natural community.

#501 Signs of Spring (Grade Level 1-6)

#526 Summer Outdoors (Grade Level 1-6)

#551 Signs of Fall (Grade Level 1-6)

#576 Winter Outdoors (Grade Level 1-6) These four learning experiences deal with seasonal changes. Use is made of plants and animals signs to study a natural area.

#601 Habitats (Grade Level 5-6) Habitats are identified and compared with regard to organisms present. Discussion includes food chains (producers, consumers, and decomposers) and the outcome if one organism is removed from the system.

#602 Plot Study (Grade Level 2-6) Small groups of students are assigned to a plot to study what is found in the plot (leaves, sticks, seeds, plants) how the objects got there and their importance to the area. Soil color and texture are also compared.

#603 Finds In A Field (Grade Level 2-6) A field is explored for objects native to the area and objects that have been introduced to the area by man or nature. Students try to determine what causes affected the introduced items.

#604 The Study of a Biotic Community (Grade Level 5-6) Students work in small groups to determine plant, animal and soil characteristics of an area. Their findings are the basis for a discussion of the basic needs of living organisms, interaction in the community, and the physical factors that limit the community.

#605 Seasonal Change - Plot Study (Grade Level 4-9) Natural cycles occurring in a selected area are studied during the year. Plots are set up in various areas and data collected from them in various seasons is compared.

#606 Micro-Climates (Grade Level 4-9) Temperature, light, water and wind interact to produce varied conditions in small areas called micro-climates. Methods for studying these micro-climates are outlined.

#651 Rainy Day (Grade Level K-6) Effects of rain are observed with regard to animal activity: raindrop size and shape; effect on colors, textures and smell; sound, and bodies of water, including puddles.

#652 Weather (Grade Level 4-6) Weather has influenced man since the beginning of existence, therefore he developed the technology to predict and modify the weather. The various components of weather and the basic instruments used for weather prediction and recording are discussed.

#701 Compass Use (Grade Level 5-6) Students learn how to use a compass to find directions and why the needle always points towards North.

#702 Mapping (Grade Level 5-6) Map of an area is made which includes the development and use of skills in compass use, pacing, map symbols, scales, and protractor use.

#703 Estimating Distances (Grade Level 5-6) Various methods for estimating distances are outlined.

#704 Estimating Heights (Grade Level 4-6) Various methods for estimating heights are outlined.

#705 Estimating Diameters (Grade Level 4-6) Various methods for determining diameters are outlined including directions for making a diameter tape and Biltmore Stick.

#802 Animals Migrate to Meet Their Living Needs (Grade Level 5-7) Animals living in the city are discussed as to their needs, why they migrated to cities, and man's role as a supplier of these animal's needs.

RESOURCE AIDS

The following materials (free and paid) are available from the Pennsylvania Game Commission, Box 1567, Harrisburg, Pa. 17120.

FREE LITERATURE:

After the Buck Season
American Woodcock in Pennsylvania
Anterless Deer License Allocations
Beaver in Pennsylvania
Bronze Beauty of the Big Woods (Turkey)
Cottontail Rabbit
Deer and Bear Harvest Map
Deer and Bear Measuring Program
Deer Diseases and Parasites
Duck Identification Chart
Environmental Concern and Wildlife - a Humane Approach
Evaluation of Game-Farm and Wild-Trapped Turkeys in Pennsylvania
Financial Report for the Fiscal Year (GAME NEWS - January Issue)
Get Your Geese in the Southeast
Highway Map of Pennsylvania
Hunting Facts of Pennsylvania
Keystone Bruin (Bear)
List of Protected Animals in Pennsylvania
List of Protected Birds in Pennsylvania
Magic of Deer Antlers
Meet the Squirrel Family
Middle Creek for Wildlife and People
Nesting Boxes, Bird Houses - How to Build Them
Official Digest - Pa. Hunting and Trapping
Of Prey and Predators
Opossum, A Look at the
Oriental Bombshell (Pheasant)
Parasites of Pennsylvania Deer
Pennsylvania Woodchuck
Plans for Martin House
Plans for Wood Duck Nesting Box
Poison Ivy! Where?
Prickley Prince of the Pinegroves (Porcupine)
Pymatuning
Pymatuning Story
Ruffed Grouse
Shohola Waterfowl Management
Some Plants are Poison
So You Don't Like Venison
10 Commandments of Shooting Safety
Transplanted Wild Pheasants--an Answer?
25 Well-Known Pennsylvania Birds
25 Well-Known Pennsylvania Mammals
Ups and Downs of Rabbits

Vanishing Spitfire (Wildcat)
Venison Needn't be "Pot Luck"
What Do Deer Eat?

Whistlin' Robert - Bobwhite Quail
White-tailed Deer
Why A Spring Gobbler Season?
Why Check the Deer Kill?
Why Use the Steel Trap?
Wildlife Conservation History
Wildlife Notes on:
    Bobcat
    Cottontail Rabbit
    Foxes (Red & Gray)
    Otter
    Owls
    Crows and Ravens
    Woodpeckers
    Raccoons
    Raptors
    Ruffed Grouse
    Squirrels
    Woodchuck
    Varying Hare
    Herons
    Beaver

Wild Turkey in Pennsylvania

PAID MATERIALS:

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Bird and Mammal Charts (Size 20" x 30")
Set #1 4 Charts ($2.00); Set #2 4 Charts ($2.00);
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Symbols Chart (State Animal, Bird, Tree and Flower)
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GAME NEWS Binders ($2.50)

Books
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BOOKS: PUBLISHER
Title; Author

ACE BOOKS
- New World No World; Herbert, F.

APPOLLO BOOKS
- Voice of the Desert; A Naturalist's Interpretation; Krutch, J. W.

BANTAM BOOKS
- Earth Day, The Beginning

BALLANTINE BOOKS
- The Population Bomb; Ehrlich, Paul
- The Environmental Handbook; Debell, Garrett
- The Frail Ocean; Wesley, Marx
- Perils of the Peaceful Atom; Curtis and Hogan
- Defoliation; Whiteside, Thomas
- Life and Death of the Salt Marsh; Teal, John and Mildred
- The User's Guide to the Protection of the Environment; Swatek, Paul
- The Alien Animals; The Story of Imported Wildlife; The Diligent Destroyers; Laycock, George
- Science and Survival; Commoner, Barry
- A Sand County Almanac; Leopold, Aldo
- SST and Sonic Boom Handbook; Shurcliff, William
- Nuclear Dilemma; Bryerton, Gene
- The Voter's Guide to Environmental Politics; Debell, Garrett
- How to Be A Survivor; Ehrlich and Harriman
- The Basic Book of Organic Gardening; Rodale, Robert
- Wilderness and Planty; Darling, Frank
- Voices for the Wilderness; Schwartz, William
- The Sierra Club Wilderness Handbook; Bower, David

DOUBLEDAY BOOKS
- The Unclean Sky; Batton, L. J. (Anchor Press)

The Metropolitan Enigma; Wilson, James Ed. (Anchor Press)
The Foxfire Book; Foxfire 2; Foxfire 3; Wigginton, Eliot (Anchor Press)

FREEMAN AND COMPANY BOOKS
Population, Evolution and Birth Control; Hardin, Garrett

GOLDEN FIELD GUIDES
Birds of North America
Trees of North America
Sea Shells of North America

GOLDEN NATURE GUIDES
Birds
Flowers
Insects
Trees
Reptiles and Amphibians
Stars
Mammals
Seashores
Fishes
Fossils
Game Birds
Zoology
Weather
Sea Shells of the World
Rock and Minerals
Butterflies and Moths
Non-Flowering Plants
Insect Pests
Pond Life
Zoo Animals
Spiders

HOLT, RINEHART BOOKS
Ecology; Odum, Eugene

HOUGHTON-MIFFLIN COMPANY BOOKS
Not So Rich As You Think; Steward, George

Since Silent Spring; Braham, Frank
Silent Spring; Carson, Rachel
The Great Chain of Life, Krutch, J. W. (Petersen Field Guide Series)
Field Guide to Birds; Petersen
Field Guide to Reptiles and Amphibians; Conant
Field Guide to Insects of North America and Mexico; Boorer
Field Guide to Mammals; Burt, W. H.
Field Guide to Butterflies; Klots, Alex
Field Guide to Trees and Shrubs; Petrides, George
Field Guide to Stars and Planets; Menzel
Field Guide to Rocks and Minerals; Plough

LITTLE, BROWN AND COMPANY BOOKS
Wilderness Bill of Rights; Douglas, W. O.
Our Plundered Planet; Osborn, Fairfield

NEW AMERICAN LIBRARY BOOKS
The Web of Life; Storer (NAL)

PRENTICE-HALL, INC. BOOKS
Concepts of Ecology; Kormondy, Ed.

RANDOM HOUSE, INC. BOOKS
The Forest and Sea - A Look at the Economy of Nature and the Ecology of Man; Bates, M.

SIMON & SCHUSTER, INC. BOOKS
Ecotactics; Mitchell, John (PB)

YALE UNIVERSITY PRESS
The Environmental Crisis; Helfrich, H., Jr.

ALSACE BOOKS AND FILMS
The Natural History Guide; Laun, H. Charles

PERIODICALS:

American Forests. Washington: American Forestry Association, Inc.

Audubon's Curious Naturalist. Lincoln, Mass: National Audubon Society.

Bio Science. N. W. Washington, D.C.: American Institute of Biological Sciences.

Catalyst for Environmental Quality. New York: Catalyst for Environmental Quality.

Conservation Directory. Washington, D.C.: National Wildlife Federation.

Conservation Federation Newsletter. Washington, D.C.: The Conservation Federation.

Conservation News. Washington, D.C.: National Wildlife Federation.

Environment. St. Louis, Missouri: Scientist's Institute for Public Information (SIPI).

Junior Naturalist. New York: American Museum of National History.

National Parks and Conservation Magazine. Washington, D.C.: National Parks and Conservation Association.

National Geographic School Bulletin. Washington, D.C.: National Geographic Society.

National Wildlife. Washington, D.C.: National Wildlife Federation.

Nature Study. Homer, New York: American Nature Study Society.

Natural History. New York: American Museum of Natural History.

Outdoor News Bulletin. Washington, D.C.: Wildlife Management Institute.

Pa. Forest Resources. University Park, Pa.: Penn State Extension Service

Pa. Angler. Harrisburg, Pa.: Pa. Fish Commission.

Pa. Game News. Harrisburg, Pa.: Pa. Game Commission.

Ranger Rick. Washington, D.C.: National Wildlife Federation.

FILMS:

Although scheduling may be difficult, there are a host of 16mm film sources. We have listed those available from the Pennsylvania Game Commission. For more information, contact your District Game Protector or the Division Office covering your area.

WILDLIFE IN SLOW MOTION (12 min.)
Slow motion photography on ducks, geese, shorebirds and other waterfowl.

CAMOUFLAGE IN COLOR (12 min.)
An educational film showing how wild birds and animals utilize protective coloration in hiding from predators.

APARTMENTS FOR RENT (12 min.)
Depicts wildlife food and cover which provide homes for wildlife. Suggests artificial or man-made shelters for areas in which natural homes are not sufficient.

ENGINEER IN A FUR COAT (20 min.)
Shows a family of beavers at work building dams, houses and canals along with other daily routines.

LOST HUNTER (20 min.)
A dramatic portrayal of the experiences suffered by a lost hunter. Shows what he did wrong and what he did right. Excellent educational message for anyone going into wilderness country.

KNOW YOUR DUCKS (20 min.)
An ideal film presentation for studying waterfowl in flight. All identification markings emphasized.

REALM OF THE WILD (25 min.)
An excellent film on wildlife and habitat. Development by the U.S. Forest Service.

THE FARM (28 min.)
A unique film involving a 3,000 acre farm property and a team of wildlife biologists and farm people demonstrate that sound farming practices and good wildlife management are compatible.

THE WOOD DUCKS WORLD (25 min.)
Ducks Unlimited portrays the life story of the Wood Duck. The picture follows the Wood Duck from the

time of hatching to fall migration. Constant predation keeps the Wood Duck ever alert.

MOURNING DOVE (27 min.)
An inspiring story of the life history and management of the mourning dove. (Any age group).

MALLARD DUCK (50 min.)
A life history of the mallard duck. Includes incubation problems, waterfowl management and economic value plus recreational value. (Any age group)

WILDLIFE MARVELS (25 min.)
Pennsylvania wildlife throughout the seasons.

WILDLIFE GUARDIANS (25 min.)
The role of the conservation officer in protecting our wildlife.

SNAKES (25 min.)
Natural history of snakes of our area.

BIRDS OR PREY OF NORTHEAST UNITED STATES (25 min.)
Shows the identifying features and habitat types of the birds of prey of this area.

THE EASTERN WILD TURKEY IN PENNSYLVANIA (25 min.)
Natural history and management of the wild turkey in our state.

A QUESTION OF HUNTING (25 min.)
Excellent film exploring the history of wildlife management and the pros and cons of hunting in our society today.

BEFORE YOU HUNT (20 min.)
An excellent primer for those just starting to hunt.

DIRECTORY

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Division of Information and Education
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Harrisburg, Pennsylvania 17120

FIELD DIVISIONS

NORTHWEST DIVISION -
1509 Pittsburgh Road
Franklin, Pennsylvania 16323
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SOUTHWEST DIVISION -
339 West Main Street
Legonier, Pennsylvania 15658
Phone: 412-238-9523

NORTHCENTRAL DIVISION -
P. O. Box 5038
Jersey Shore, Pennsylvania 17740
Phone: 717-398-4744

SOUTHCENTRAL DIVISION -
P. O. Box 537
Huntingdon, Pennsylvania 16652
Phone: 814-643-1831

NORTHEAST DIVISION -
P. O. Box 220
Dallas, Pennsylvania 18612
Phone: 717-675-1143

SOUTHEAST DIVISION -
R. D. 2
Reading, Pennsylvania 19605
Phone: 215-926-3136

Bureau of State Parks
Program Services and Operations Division
P. O. Box 1467
Harrisburg, Pennsylvania 17120

Regional Offices:

State Parks Region #1
R. D. 1, Box 1-A
Emporium, Pennsylvania 15834
(814) 483-3365

State Parks Region #3
Shawnee State Park
Schellsburg, Pennsylvania 15559
(814) 733-2202

State Parks Region #2
Moraine State Park
R. D. 1
Prospect, Pennsylvania 16052

State Parks Region #4
Nockamixon State Park
R. D. 3
Quakertown, Pennsylvania 18951

And so the end of another environmental publication. There will be more and some will be better. But for now, we hope this one helps you to make your kids more aware of the environment we all share.

In a day when our life-style is hurried by the pace of technology, we think there is beauty to be found in things that are commonplace. In a winter entry to his journal, Thoreau said it well...

> ...When I have only a rustling oak leaf.
> Or the faint metallic cheep of a tree sparrow,
> For variety in my winter walk,
> My life becomes continent
> And sweet as the kernel of a nut.